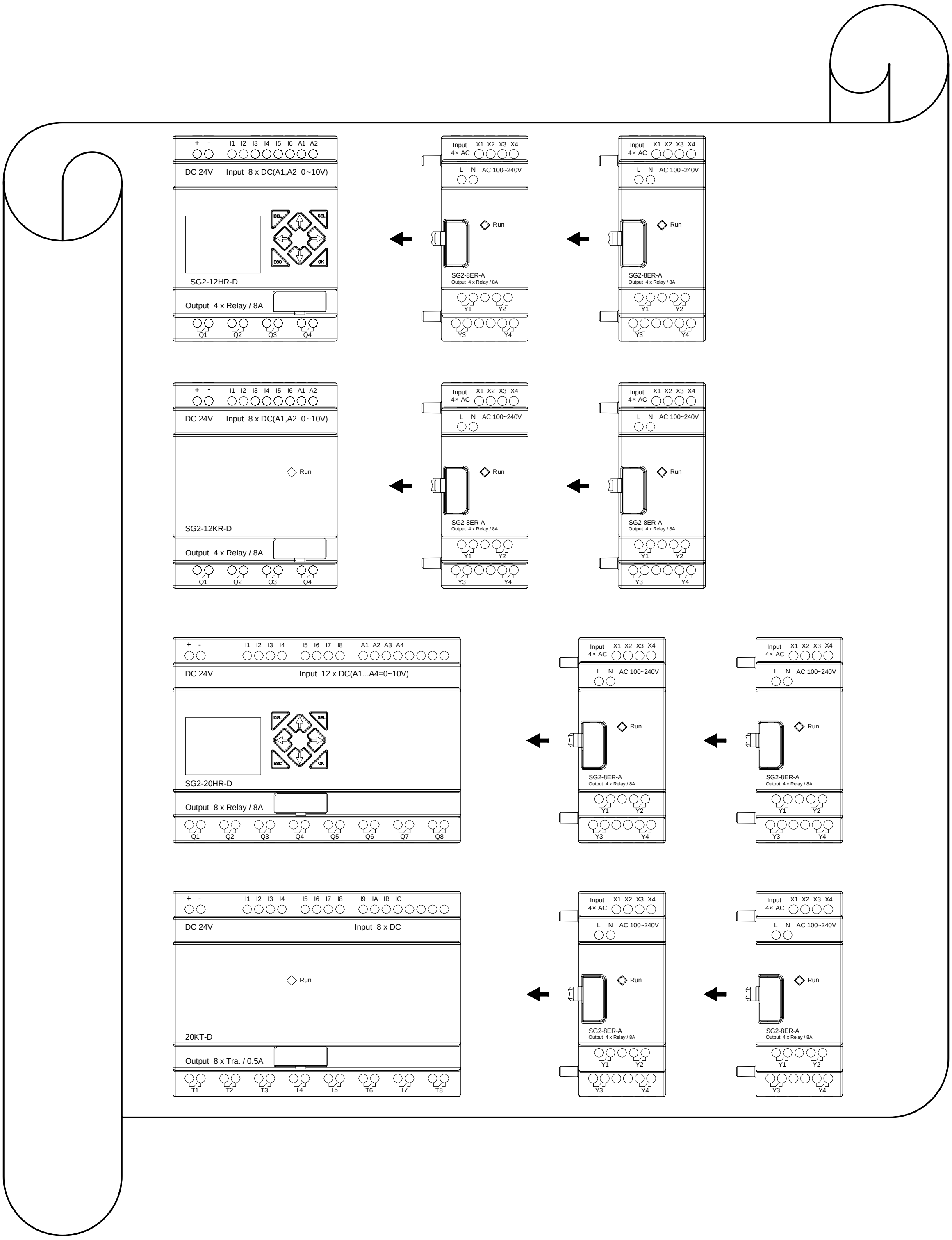
TECO SG2 Micro-Controller Operation Manual

Version：First Edition



	20KR-12D		◎		12*	8	Relay	4	◎		◎	◎		
	Standard Variant without up-cover													
	20CR-A	◎			12	8	Relay		◎					
	20CR-D		◎		12*	8	Relay	4	◎			◎		
	20CT-D		◎		12*	8	Transistor	4	◎			◎	◎	
	20CR-12D		◎		12*	8	Relay	4	◎			◎		
	High-speed communication Variant													
	20VR-D		◎		12*	8	Relay	4	◎	◎	◎	◎		◎
	20VT-D		◎		12*	8	Transistor	4	◎	◎	◎	◎	◎	◎
Expansion	8ER-A	◎			4	4	Relay							
	8ER-D		◎		4	4	Relay							
	8ET-D		◎		4	4	Transistor							

◎: YES

* : The input points consist of the ones having analog input function.

12-3 Power Supply Standard Discrete Input

.12-3-1 AC/DC 24V

Item	**SG2-10HR-A** **SG2-10KR-A** **SG2-10CR-A**	**SG2-20HR-A** **SG2-20KR-A**	**SG2-20HR-D** **SG2-20KR-D** **SG2-20HT-D** **SG2-20KT-D**	**SG2-12HR-D** **SG2-12KR-D** **SG2-12CR-D** **SG2-12HT-D** **SG2-12KT-D** **SG2-12CT-D**
Operation voltage	AC 100~240V	AC 100~240V	DC 24V	DC 24V
Voltage Range	AC 85~264V	AC 85~264V	DC 20.4~28.8V	DC 20.4~28.8
Operation frequency	50 / 60 Hz	50 / 60 Hz		
Frequency limits	47～63Hz	47～63Hz		
Momentary interrupt	10 ms(half period) / 20 times (IEC	10 ms(half period) / 20 times (IEC	1ms/10times (IEC 61131-2)	10ms/10times(IEC 61131-2)

TECO Electric & Machinery Co., Ltd

Safety Precaution

Ⅰ.Precaution for Installation:

⚠ Never install the product in the environment beyond the one brochure and user manual specified, such as high temperature, humidity, dust, erosive gas, vibration, impact condition resulting in the risk of inductive electricity, fire and error operation.

⚠ Please exactly comply with the installation instruction in the user manual, or the undesired situation as falling down, accident or error operation would happen to the SG2.

⚠ Pay close attention to the cable and conductor incidentally fall into the module to prevent fire, trouble and wrong action.

Ⅱ.Precaution for Wiring:

⚠ Connect Class 3 grounding in accordance with the Electricity Engineering Regulations. NO grounding or improper grounding might lead to troubles such as electric shock and error operation.

⚠ Apply the rated power supply and specified cables. Wrong power supply would render fire.

⚠ The wiring shall be carried out by the certified electrician pursuant to the provisions set forth in the Electricity Engineering Regulations.

⚠ Improper wiring would lead to fire, trouble, and induction electricity.

Ⅲ.Precaution for Operation:

⚠ When the power is on, never contact the terminal to avert electrical induction.

⚠ It is strongly recommended to add the safety protection such as the emergence stop and external interlock circuit to prevent the SG2 from trouble and mechanical damage.

⚠ Run the SG2 after safety confirmation. Error operation will result in mechanical damage.

⚠ Please pay attention to the power on procedure. Wrong process flow would lead to mechanical damage or other hazards.

List

Chapter 1 General

SG2 is a tiny smart PLC having 44 points O/I system, applying ladder graphic program and FBD program, and applicable to the small-scale automatic operation. SG2 can expand 3 groups of 4-input-4-output module, one 4AI Module, one communication Module. The smart mobility and supremacy the SG2 inheres are greatest assistance for you to considerably save both time and cost in operation. The special features the SG2 owns are presented below:

Feature 1

Complete product line:

(1) Dimension for the super-mini standard 10/12/20 points

a) 10/12 points variant：72X90X59.6 (mm)

b) 20 points variant：126X90X59.6 (mm)

(2) Max. 3 group I/O Expansive Module, one 4AI Module,one communication Module: 38×90×59.6 (mm),

(3) Versatile RTC and analog input (10 bits)

(4) Low price variant without LCD/Keypad and blind variant (without up cover)

Feature 2

Selective input and output

(1) Input: AC 85 ~ 264V or DC 21.6~ 26.4V or DC9.6~14.4V

(2) Output: Relay or Transistor

Feature 3

Easy to learn and to operate

(1) Built-in 12 x 4 LCD display and 8 keys for inputting ladder program

(2) The computer compiled programs are applicable to WIN 32 platform (Windows 95/98/ME/NT/2000/XP)

(3) Programming by PDA, Monitoring by PDA

(4) Seven languages: English, French, Spanish, Italian, German, Portuguese and Simplified Chinese.

Feature 4

Ease installation and maintenance

(1) Screw installation

(2) DIN rail installation

(3) Spare program cartridge PM05 (optional)

(4) LCD display shows online input and output in operation

Feature 5

(1) Multiple outputs: Relay output, Max. 8A/points (resistive load). Transistor output 0.5A/Point(resistive load)

(2) It can directly drive 1/3 HP motor.

(3) Sufficient program memory and abundant Instruction

① Max. 200 step Ladder Instruction input or 99 blocks of FBD.

② Many built-in Application Instructions

◎ Timer

◎ Counter

◎ Time comparison

◎ Analog comparison

◎ Upper and lower differentiation

◎ PWM Function

◎ I/O LINK Function

◎ REMOTE I/O Function

◎ HMI Function

(4) Internationally certified by:

① CE mark

② cUL/UL

Chapter 2 Operation Precaution

2-1 Installation Environment

The following environments are not favored to install SG2:

◎ The area is under direct sunshine or the ambient temperature is beyond -20-55°C.

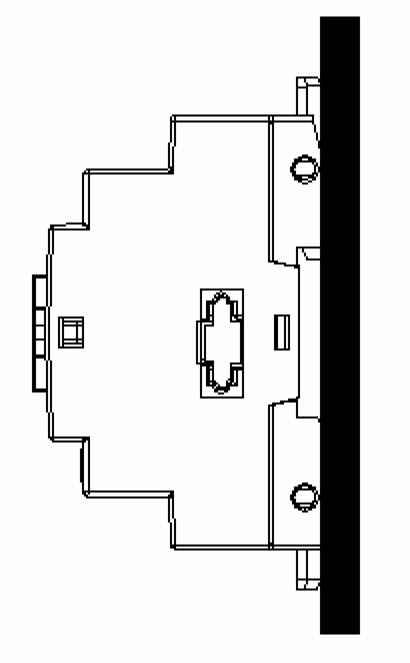
◎ The relative humidity exceeds 5-90%, the temperature is subject to rapid change, susceptible to condensation.

◎ The area contains inflammable or erosive gases

2-2 Installation

◎ Firmly fasten the cable with lock screws to ensure no poor contact.

Installation drawing



2-3 Wiring

◎ The I/O signal cables shall not be routed parallel to the power cable, high current cable or in the same high current cable trays to avoid the signal interference.

2-4 Static Electricity

◎ In the extremely arid area, the humans ' body is susceptible to generate of static electricity. Never touch the SG2 with hands to avert static damage to the SG2.

2-5 Cleanness

Use the clean and dry cloth to wipe the surface of the SG2. It is prohibited to clean the SG2

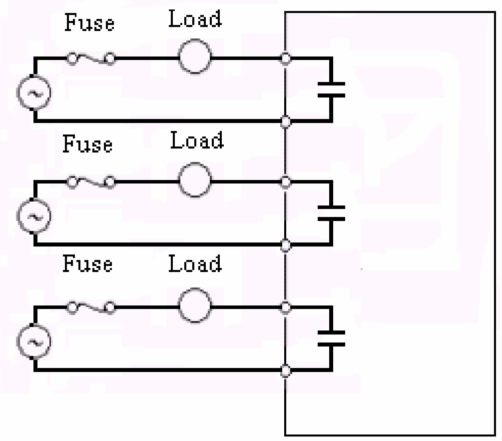
with water or volatile solvent to prevent structure deformation and discoloration.

2-6 Storage

◎ The time memory of SG2 RTC applies super capacity which is susceptible to high temperature and humidity. The SG2 shall be kept away from the said place.

2-7 Over-current Protection

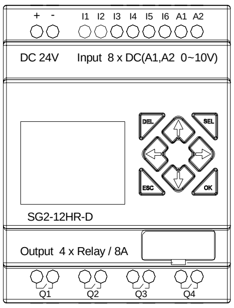
◎ The SG2 is not incorporated a protective fuse at the output terminal. To avoid the short circuit on the load side, it is recommended to cable a fuse between each output terminals and loads.

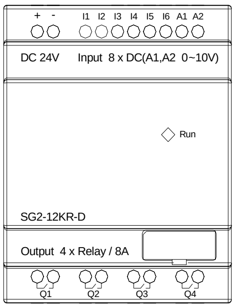


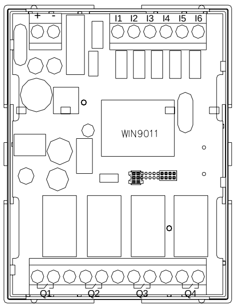
Content

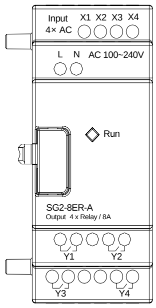
Chapter 3 System Configuration

3-1 Basic System Configuration







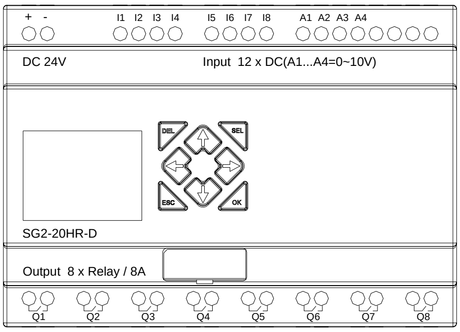


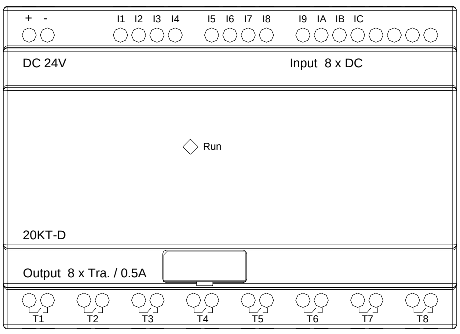
SG2 10/12 Points：

Expansion Type	Blind Type	Bare board Type (economical type)
◎ 10HR-A	◎ 10KR-A	◎ 10CR-A
◎ 12HR-D	◎ 12KR-D	◎ 12CR-D
◎ 12HT-D	◎ 12KT-D	◎ 12CT-D
◎ 12HR-12D	◎ 12KR-12D	◎ 12CR-12D

SG2 expand I/O & COMM：

◎ 8ER-A	◎4AI	◎Profibus
◎ 8ER-D	◎Modbus	◎TCP/IP
◎ 8ET-D	◎Devicenet	

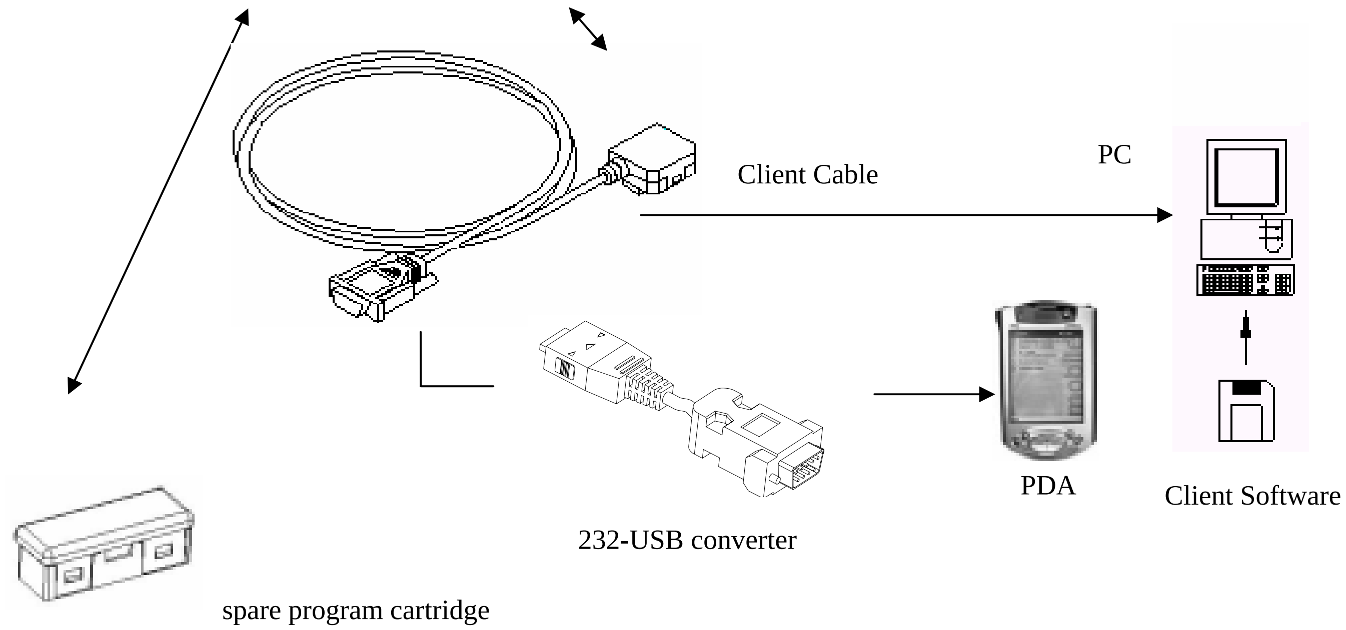




SG2 20 points:

Expansion Type	High-Speed Type
◎ 20HR-A	◎ 20VR-D
◎ 20HR-D	◎ 20VT-D
◎ 20HT-D	
◎ 20HR-12D	

Blind Type	Bare board Type (Economic)
◎ 20KR-A	◎ 20CR-A
◎ 20KR-D	◎ 20CR-D
◎ 20KT-D	◎ 20CT-D
◎ 20KR-12D	◎ 20CR-12D



3-2 Configuration for computer Connection and Spare Program Cartridge

(1) Link the computer and SG2 with Client Cable. Through the Client software, the computer is ready to read and write the programs contained in SG2 and oversee on line operation in SG2. (See the figure below)

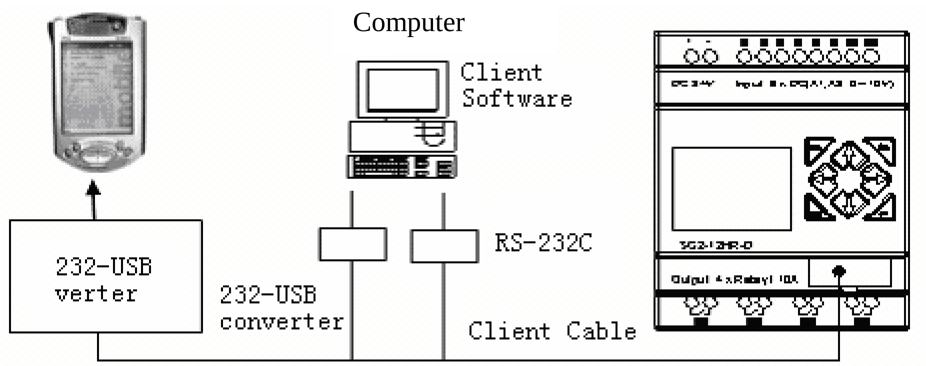


Figure 3-2-1

Note: SG2 PDA software suits PDA based on WIN CE and matching with the connector SG2-PL02, Such as HP2200, 2190 and 2210, etc.

(2) Plug PM05 into the SG2 which is able to load and recover the programs from the PM05. (See the figure below)

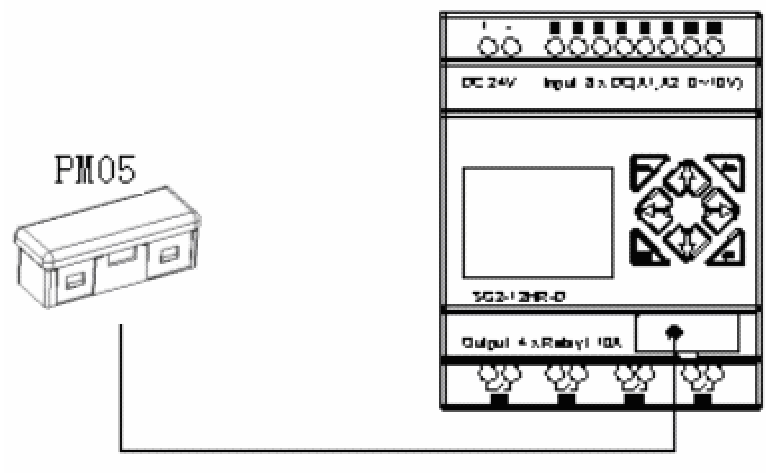


Figure 3-2-2

Chapter 4 Installation

4.1 Installation Environment

The SG2 PLC is prohibited to be installed under the following environments:

◎ The ambient temperature is beyond -20℃~55℃.

◎ The relative humidity exceeds 5~90%.

◎ Area is brimful of dust, salt and iron powder.

◎ Under direct sunshine.

◎ The environment is subject to frequent vibration and impact.

◎ The area contains erosive and inflammable gases susceptible to fire.

◎ The area is abundant of volatile oil gas, organic solvent, ammonia, electrolytic gas.

◎ Poor ventilation or close to heating source.

4.2 Installation and wiring method

Warn:

Such product users should have special skill about PLC system. Only the persons qualified are access to control, install and use the products.

The operator and the equipment will be damaged if neglect such warning.

Precaution for Wiring

◎ The I/O signal wire shall not be routed in parallel to the power wire or placed in the same tray.

◎ Adopt 0.75-3.5mm^2 cable as the external wire.

◎ Apply 4~6kgf.cm torques to tighten the lock screws.

4-2-1 H-TYPE PRODUCTS:

SG2-12H#-D //12H#-12D

SG2-20##-D //20##-12D

SG2-10HR-A//10HR-24A

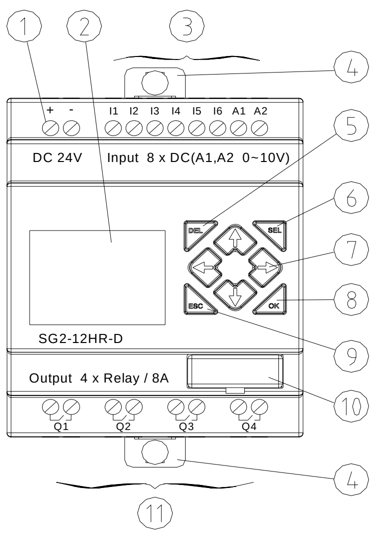
SG2-20HR-A//20HR-24A

WARN:

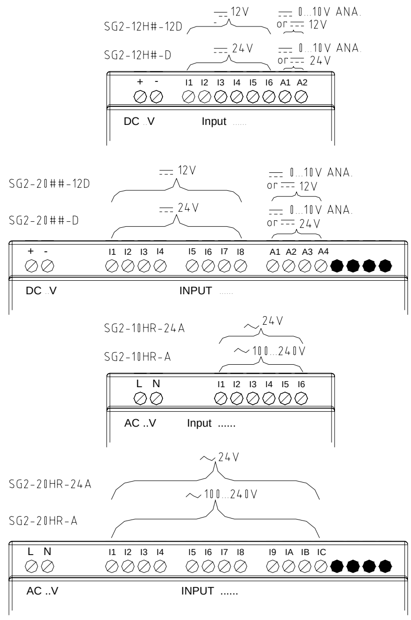
Unintentional equipment operation.

The application of this product requires know-how in design and program of control system. Only persons qualified are allowed to program, install and apply this product.

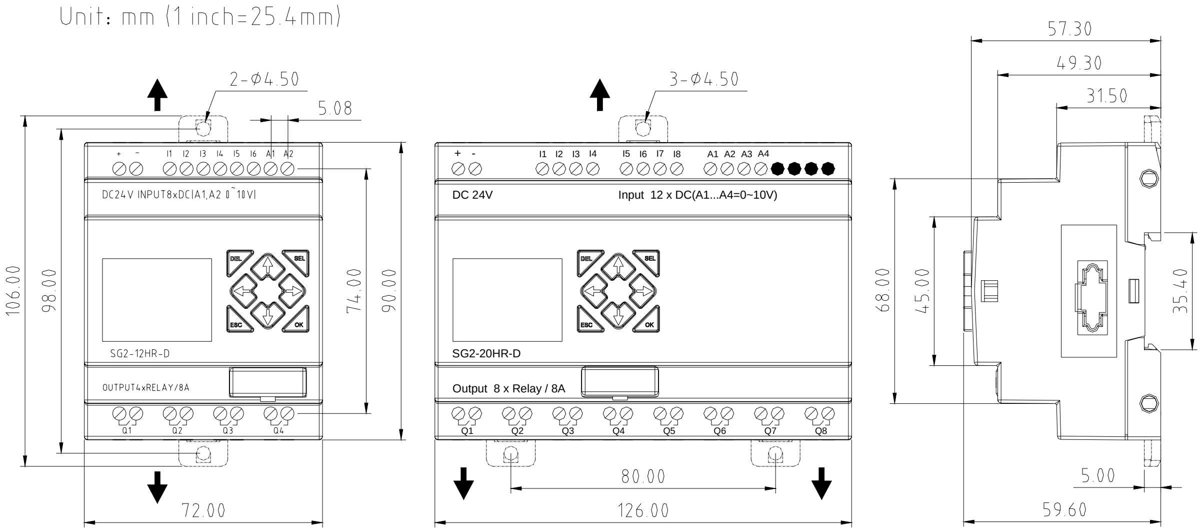
Failure to follow this instruction will result in death, serious injury or equipment damage.

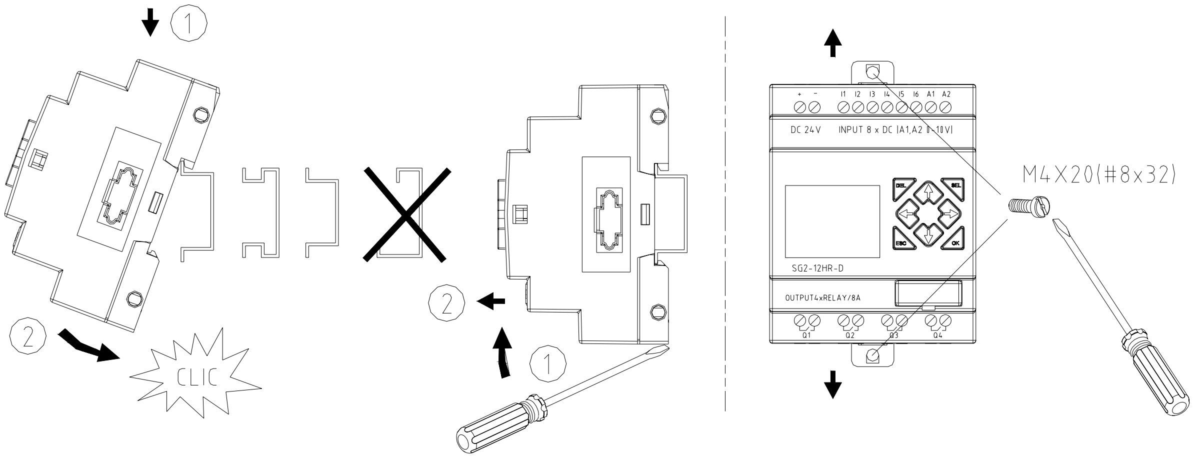


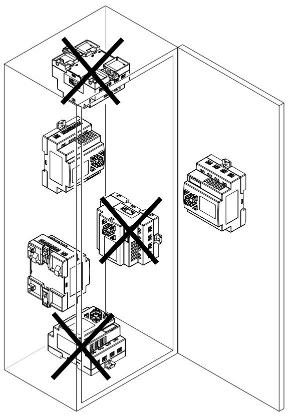
①- Power supply terminals
②- LCD display
③- Input terminals
④- Retractable mounting feet
⑤- Delete key
⑥- Selection key
⑦- Direction keys(left/right/up/down)
⑧- Ok key
⑨- Escape key
⑩- EEPROM cartridge or PC cable connection
⑪- Output terminals



Unit: mm (1 inch=25.4mm)





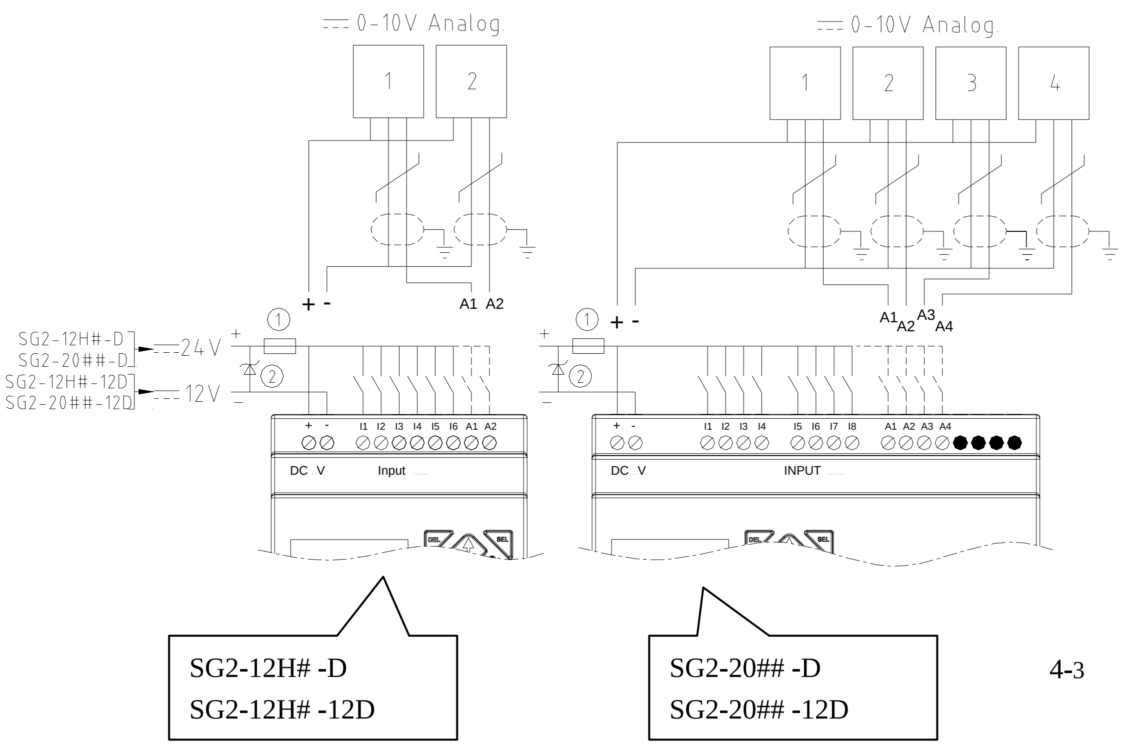


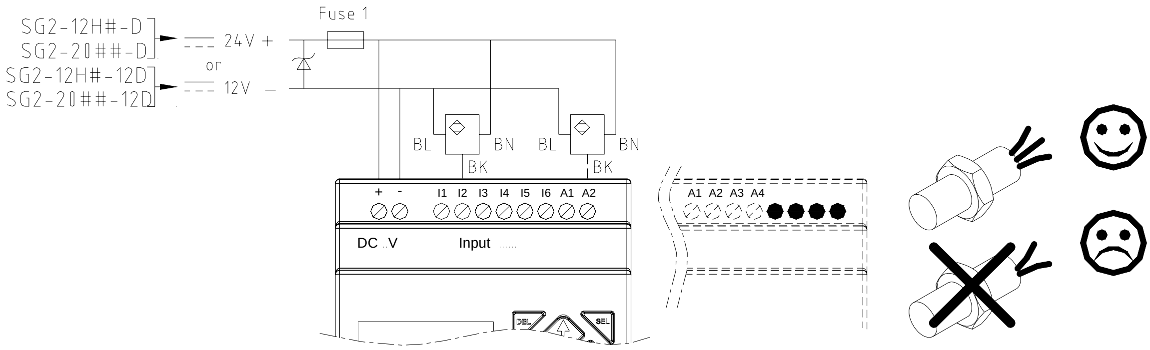
mm^2	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

	C		
∅3.5 (0.14in)	C	Nm	0.6
		lb-in	5.4

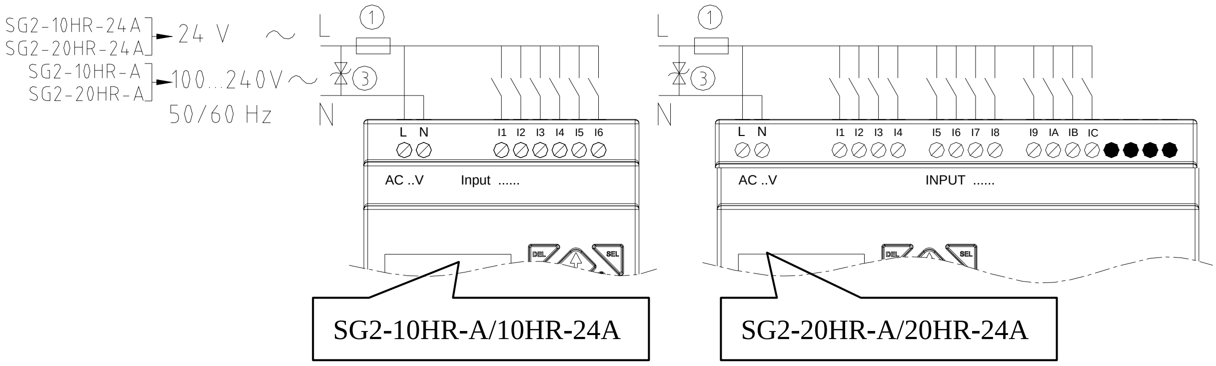
DANGER:
HAZARDOUS VOLTAGE
Cut off all power before maintenance.
Electric shock will result in death or serious injury.

Input 12/24V DC:

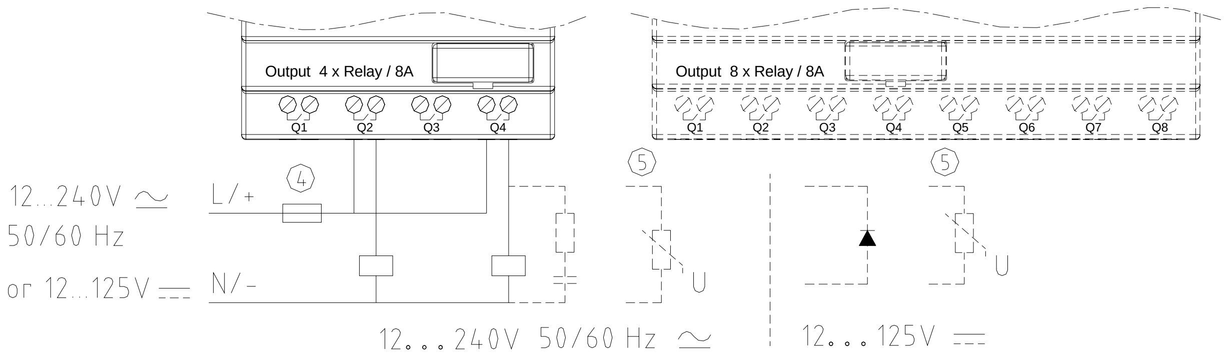




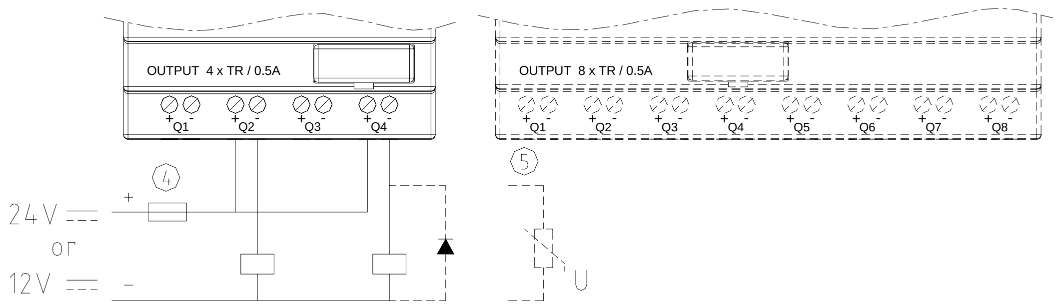
Input 24V AC or 100…240V AC:



Output (Relay):

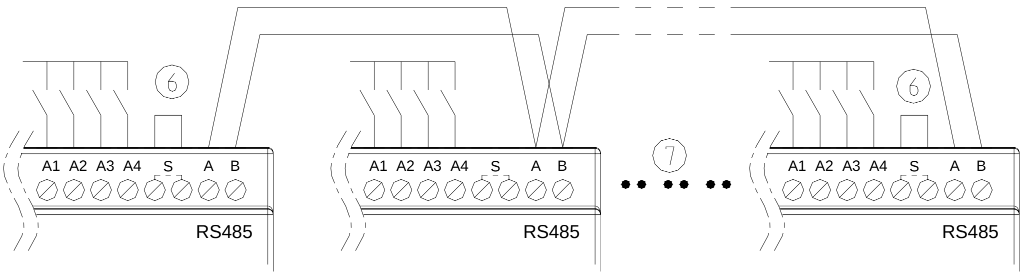


Output (Transistor):



I/O link or Remote I/O:

(Only products, SG2-20VR-D/20VT-D/20VR-12D/20VT-12D are available.)



①-1A quick-blowing fuse, circuit-breaker or circuit protector

②-Surge absorber (36V DC)

③-Surge absorber (400V AC)

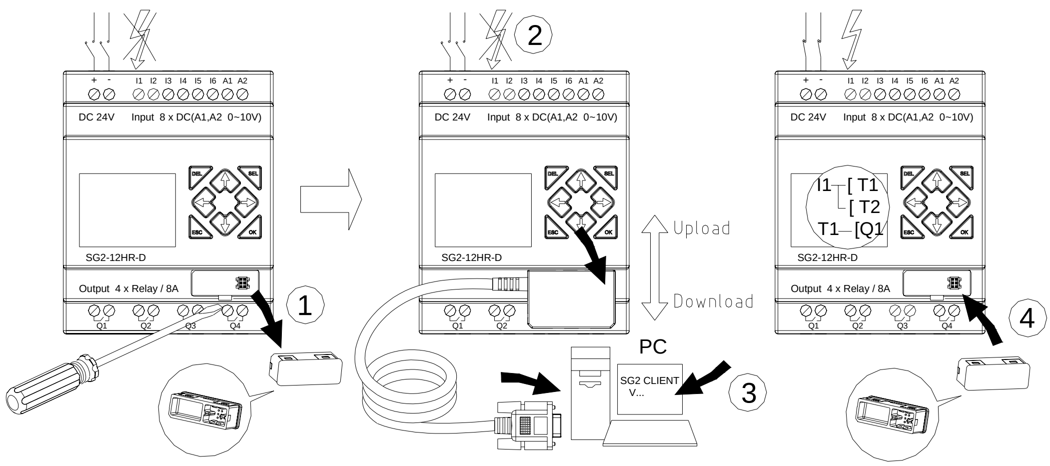
④-Fuse, circuit-breaker or circuit protector

⑤-Inductive load

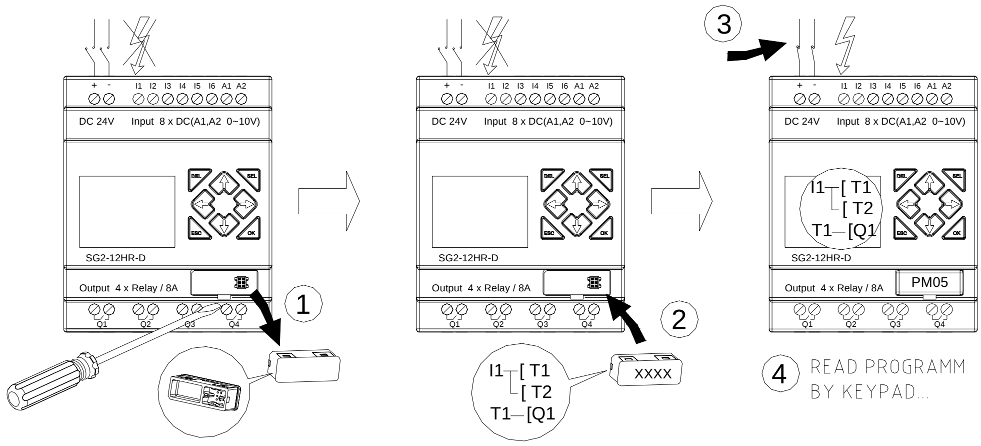
⑥-Only short circuit the first product and the last product

⑦-Comply with standard : EIA RS-485.When I/O link, the net can connect 8 products in max.（ID：1~8）.When Remote I/O is available, it only can connect 2 products in max.（MASTER & SLAVE）。

Communicate with SG2 CLIENT Software:



Communicate with PM05:


DC 24V
Input 8 x DC(A1,A2 0~10V)
SG2-12HR-D
Output 4 x Relay / 8A
1
2
I1─[T1
[T2
T1─[Q1
XXXX
3
PM05
4
READ PROGRAMM
BY KEYPAD...

4-2-2 K-TYPE PRODUCTS:
SG2-12K#-D //12K#-12D
SG2-20K#-D //20K#-12D
SG2-10KR-A//10KR-24A
SG2-20KR-A//20KR-24A
WARN:
Unintentional equipment operation.

The application of this product requires know-how in design and program of control system. Only persons qualified are allowed to program, install and apply this product.

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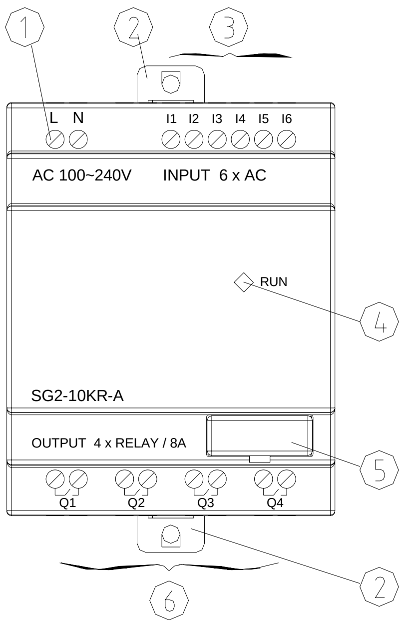
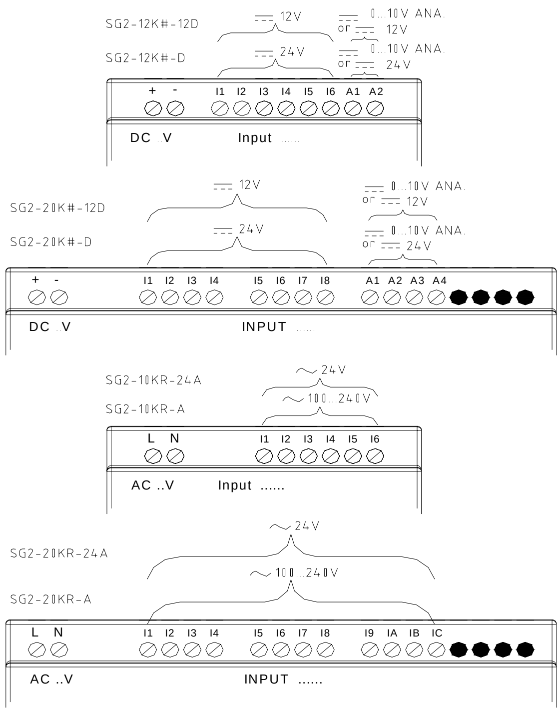
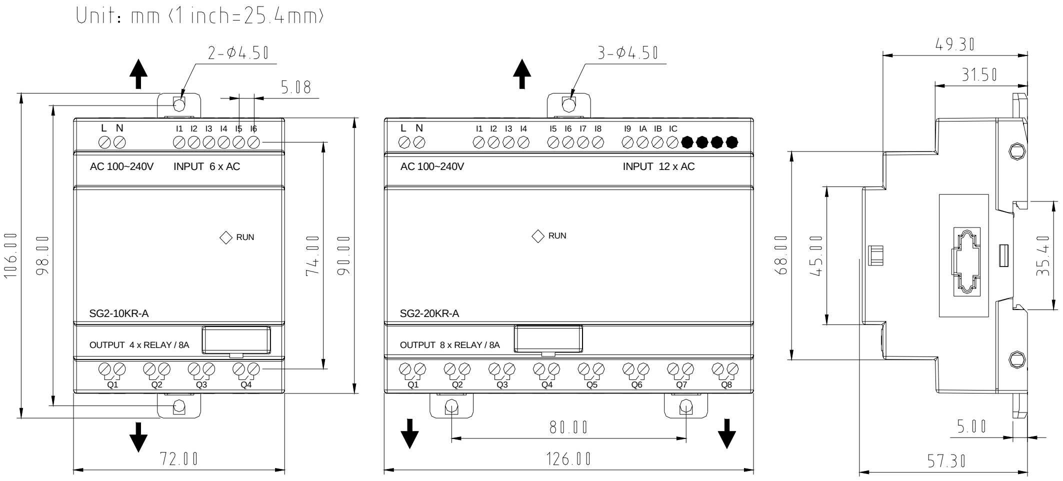
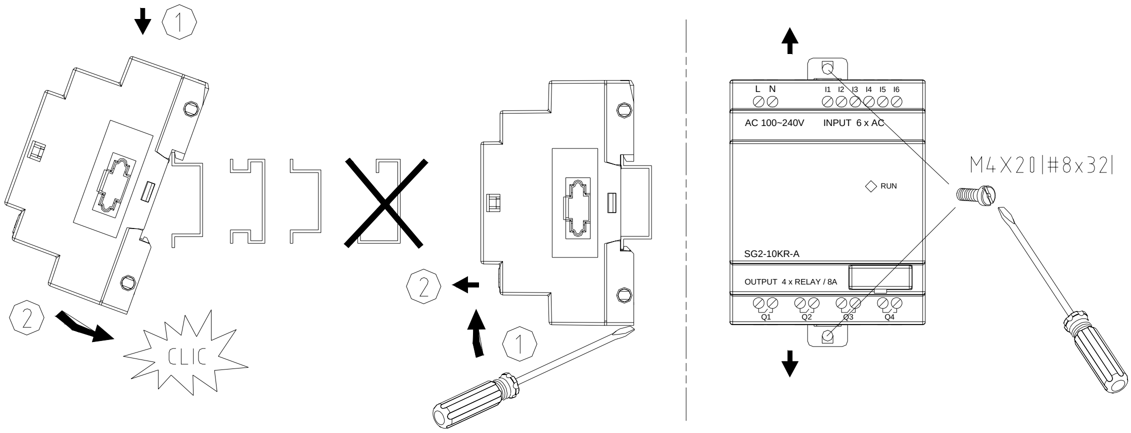
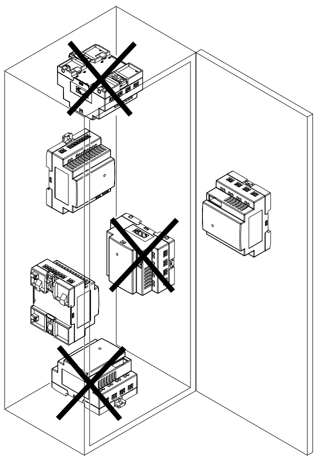


①-Power supply terminals
②-Retractable mounting feet
③-Input terminals
④-Voltage/ Operating mode green signaling LED
⑤-EEPROM cartridge or PC cable connection
⑥-Relay output terminals









mm^2	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

	C		
∅3.5 (0.14in)	C	Nm	0.6
		lb-in	5.4

DANGER:

HAZARDOUS VOLTAGE

Cut off all power before maintenance.

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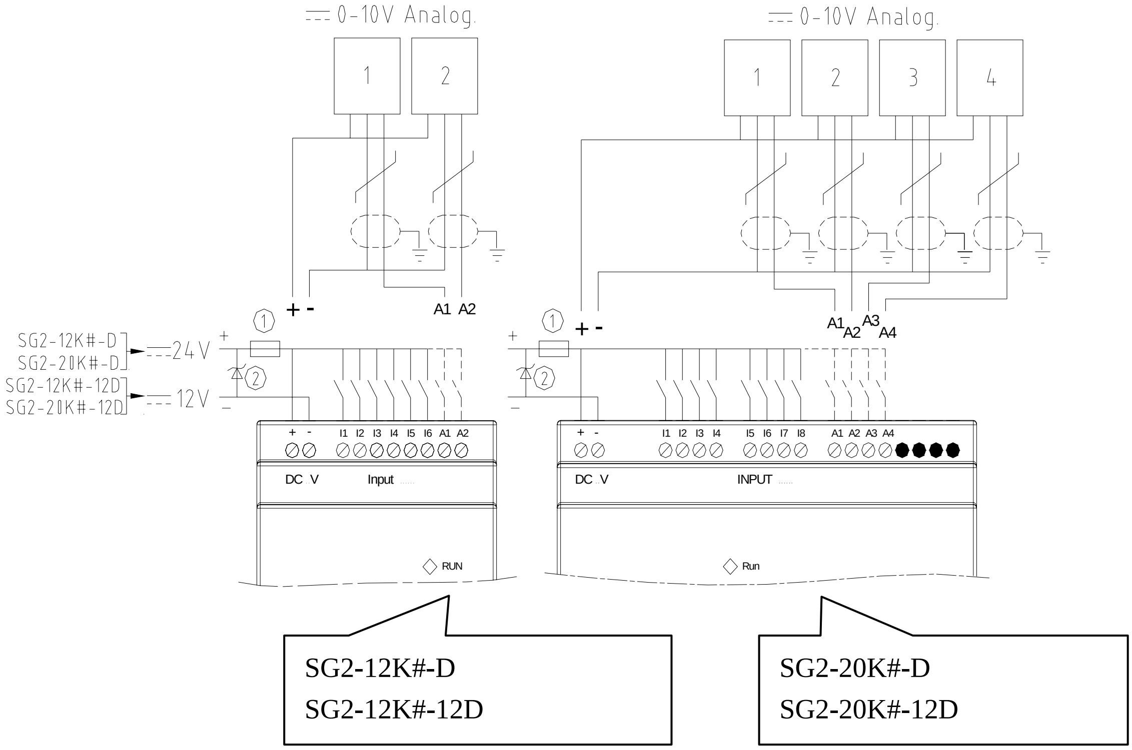
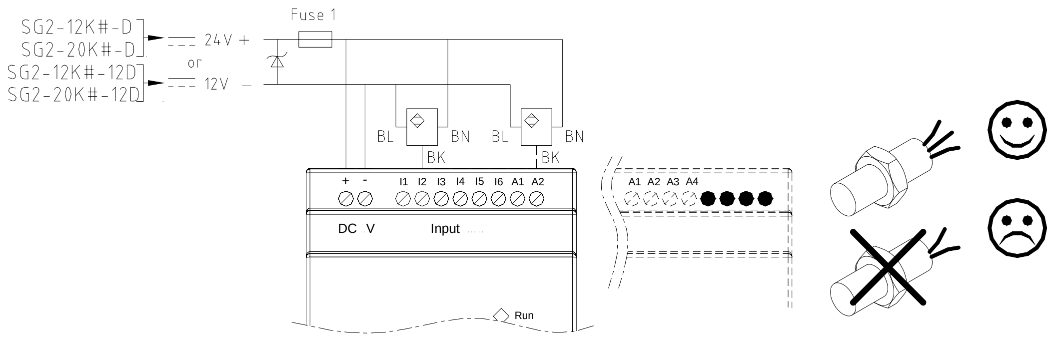
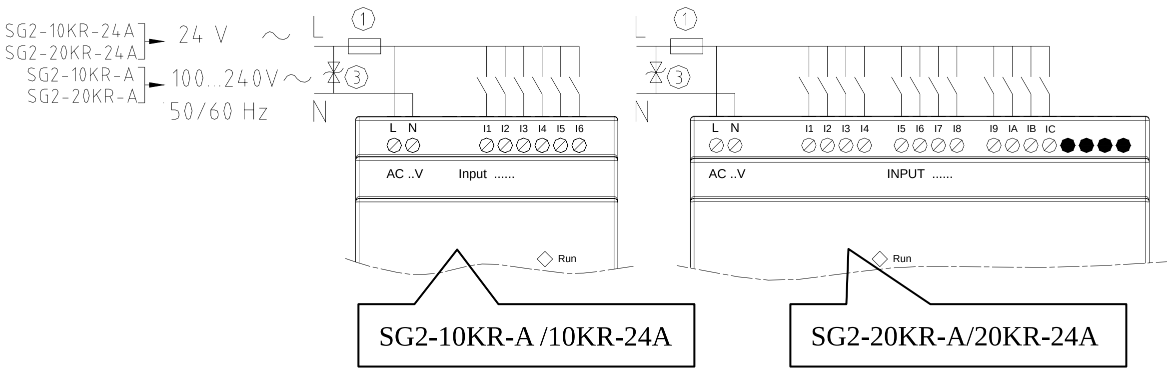
Input 12/24V DC:

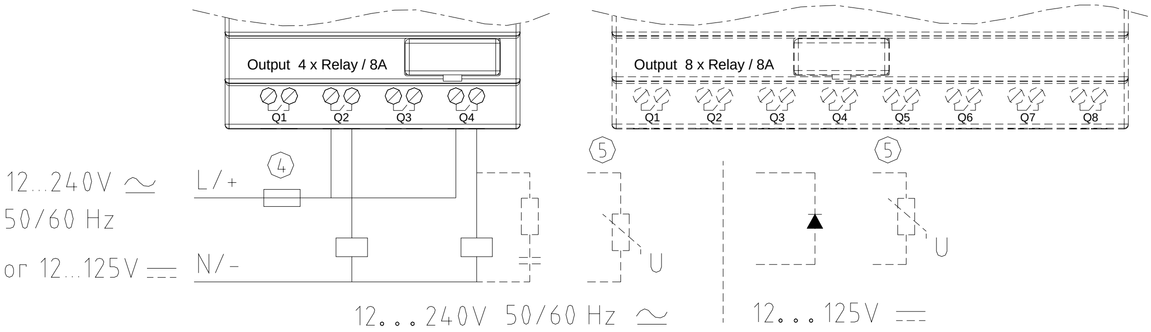




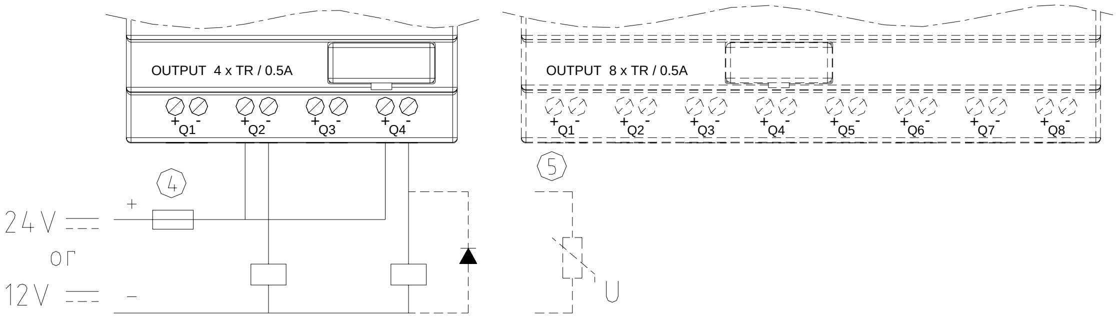
Input 24V AC or 100…240V AC:



Output (Relay):

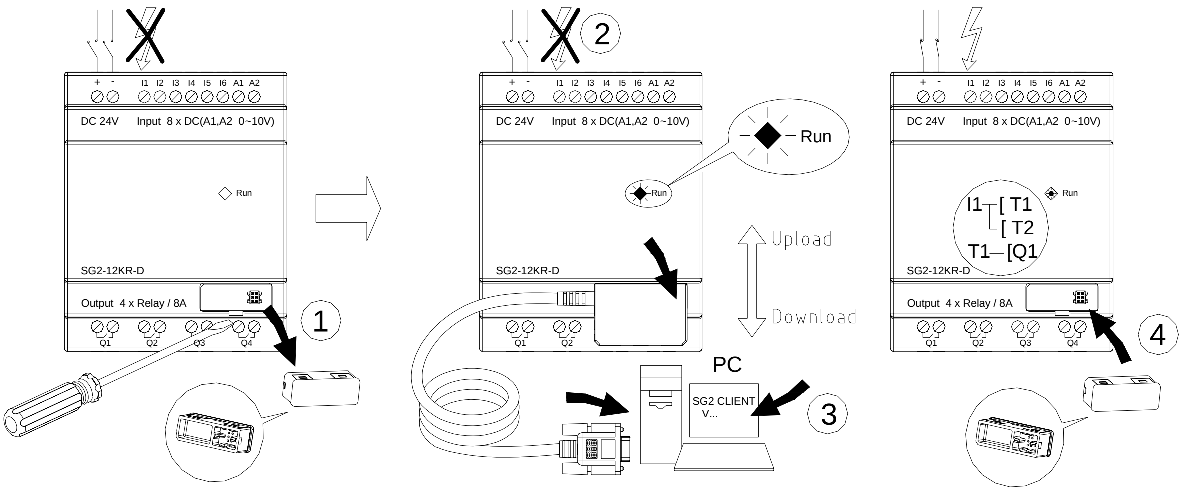


Output (Transistor):



- 1A quick-blowing fuse, circuit-breaker or circuit protector
- Surge absorber (36V DC)
- Surge absorber (400V AC)
- Fuse, circuit-breaker or circuit protector
- Inductive load

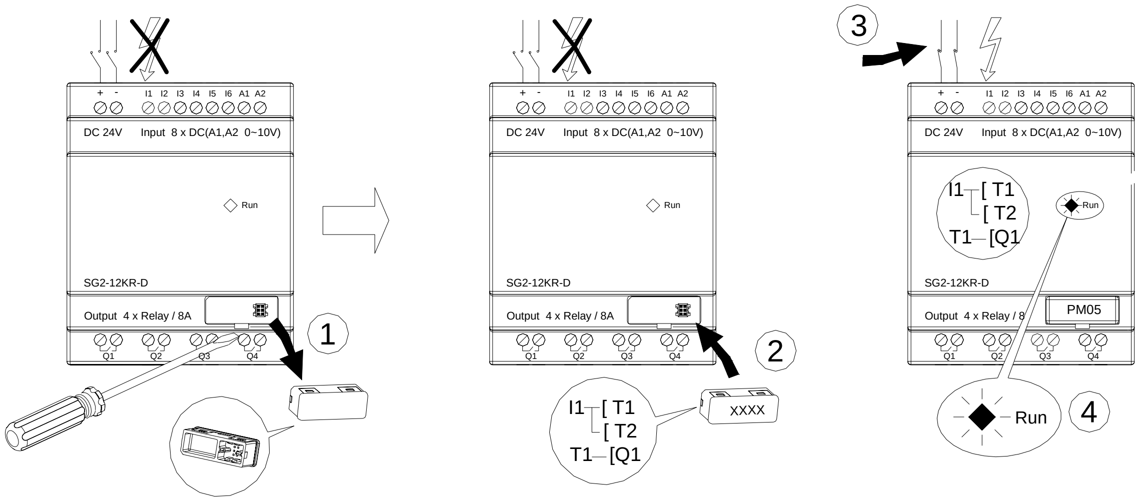
Communicate with SG2 CLIENT Software:



- Unplug the PM05 cartridge first.
- Don’t electrify until the CLIENT CABLE is connected.
- Execute SG2 CLIENT software online.

- Plug the PM05 cartridge again after confirming the program is transferred.

Communicate with PM05:



- Unplug the PM05 cartridge first.
- Please do not electrify the product before PM05 is plugged.
- Electrify the product, the program will automatically transferred & executed.
- Following is what the LED working in different state description:

Run	Diagnose
◆	Power on the product, and the mould is ready.
◆ (slowly blinking)	Slowly blinking, module is in Run mode.
◆ (rapidly blinking)	Rapidly blinking(5Hz), module in Fault mode. -ROM error -Incompatible Program -EEPROMerror -Expansive module error

4-2-3 C-TYPE PRODUCTS:
SG2-12C#-D //12C#-12D
SG2-20C#-D //20C#-12D
SG2-10CR-A//10CR-24A
SG2-20CR-A//20CR-24A
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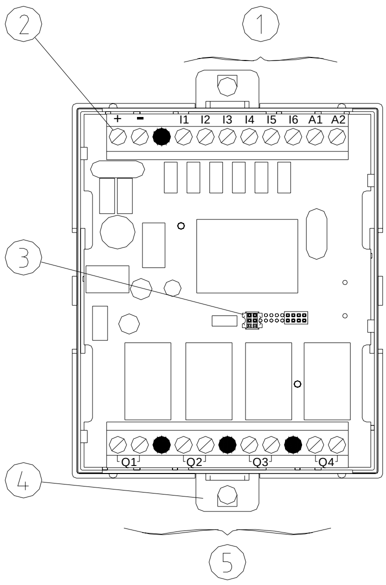
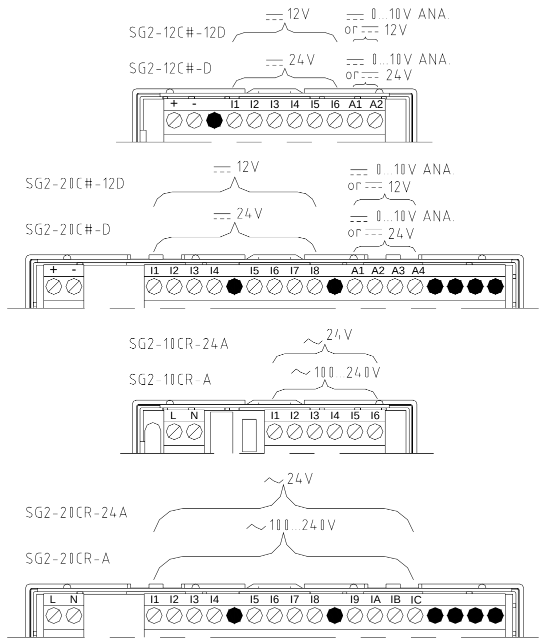
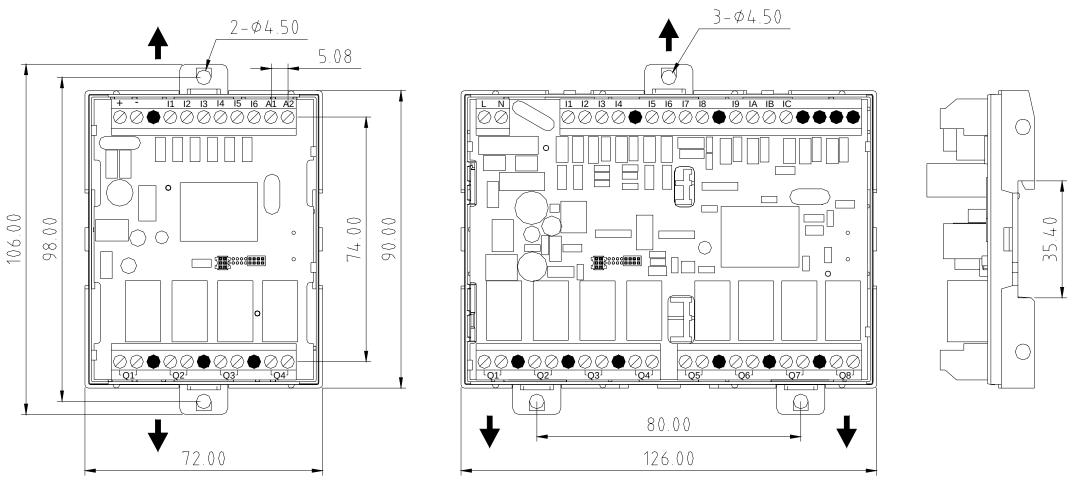
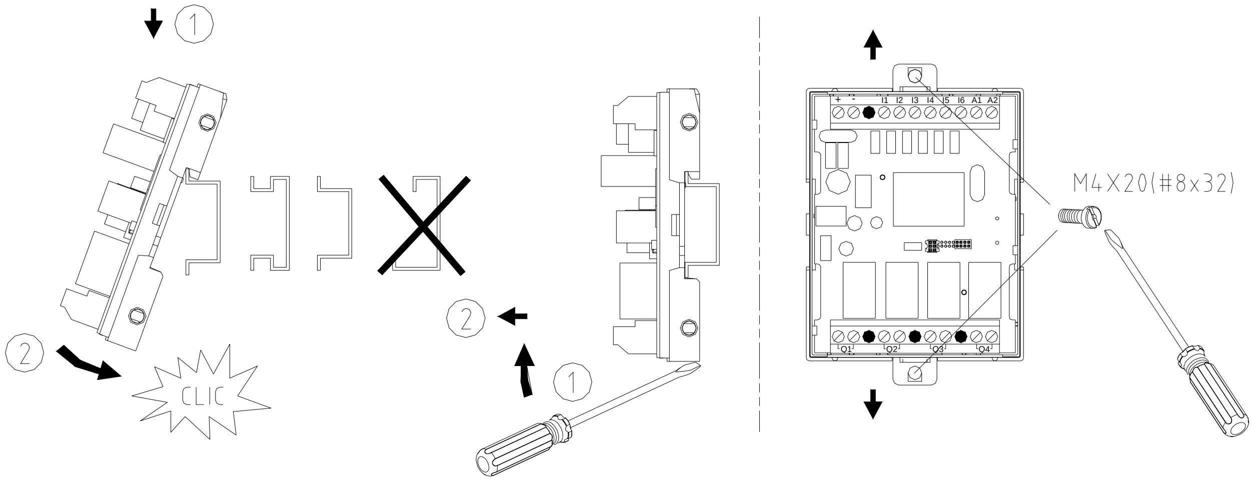


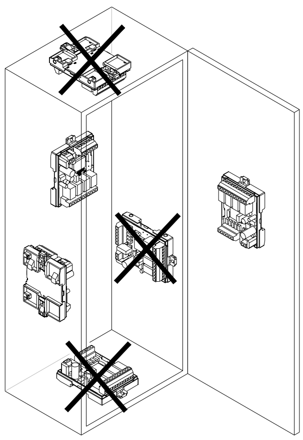
①- Input terminals
②- Power supply terminals
③- EEPROM cartridge or PC cable connection
④- Retractable mounting feet
⑤- Output terminals



Unit: mm (1 inch=25.4mm)





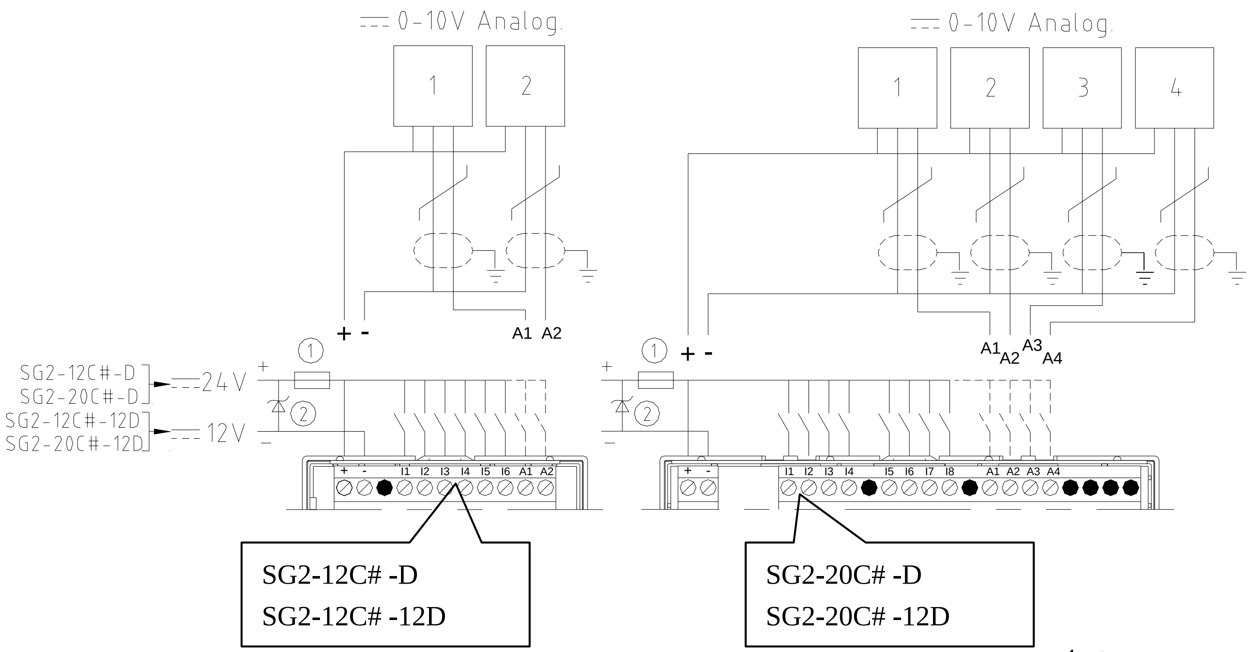


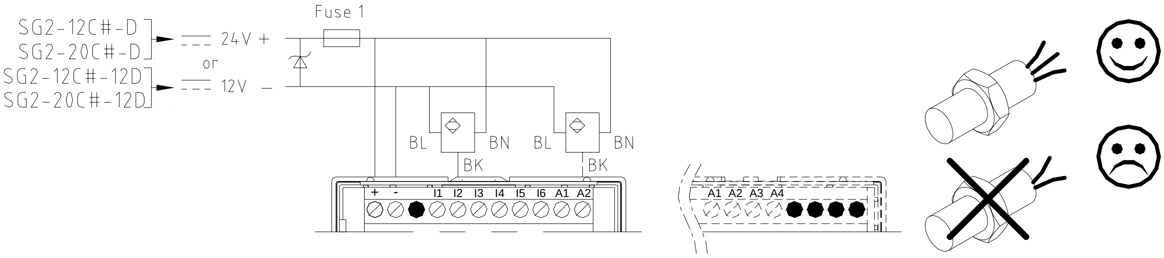
mm^2	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

∅3.5 (0.14in)	C	Nm	0.6
		lb-in	5.4

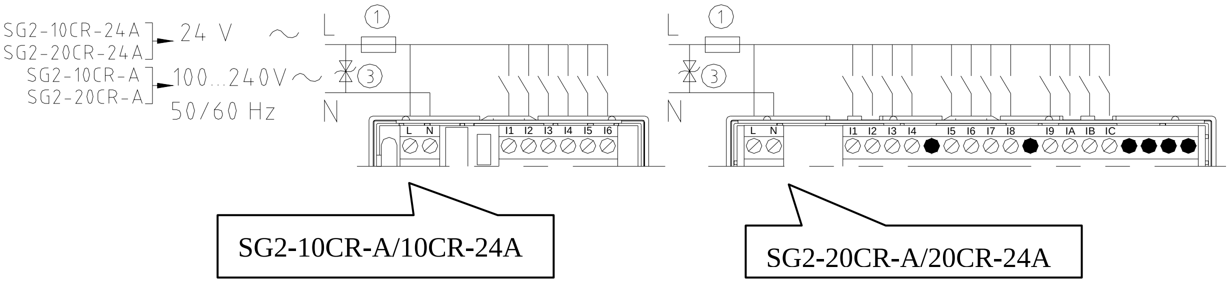
DANGER:
HAZARDOUS VOLTAGE
Cut off all power before maintenance.
Electric shock will result in death or serious injury.

Input 12/24V DC:

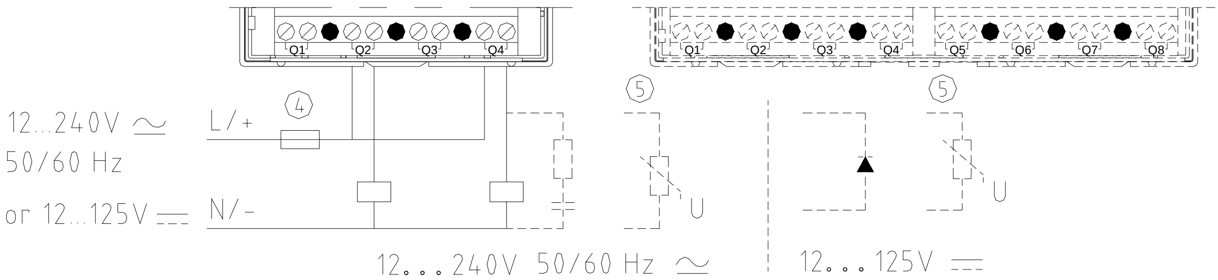




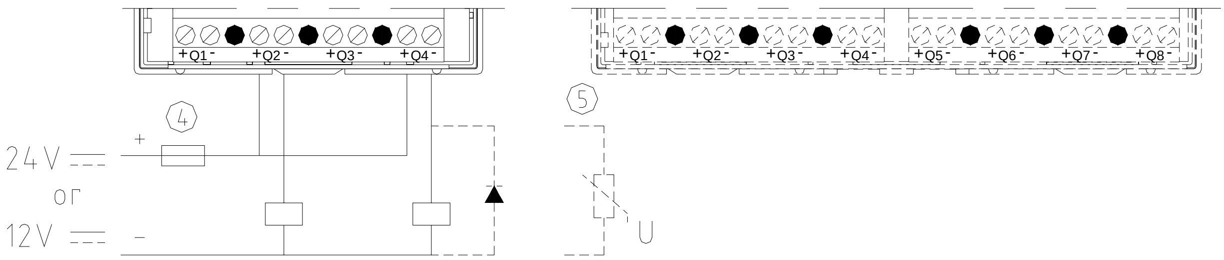
Input 24V AC or 100…240V AC:



Output (Relay):



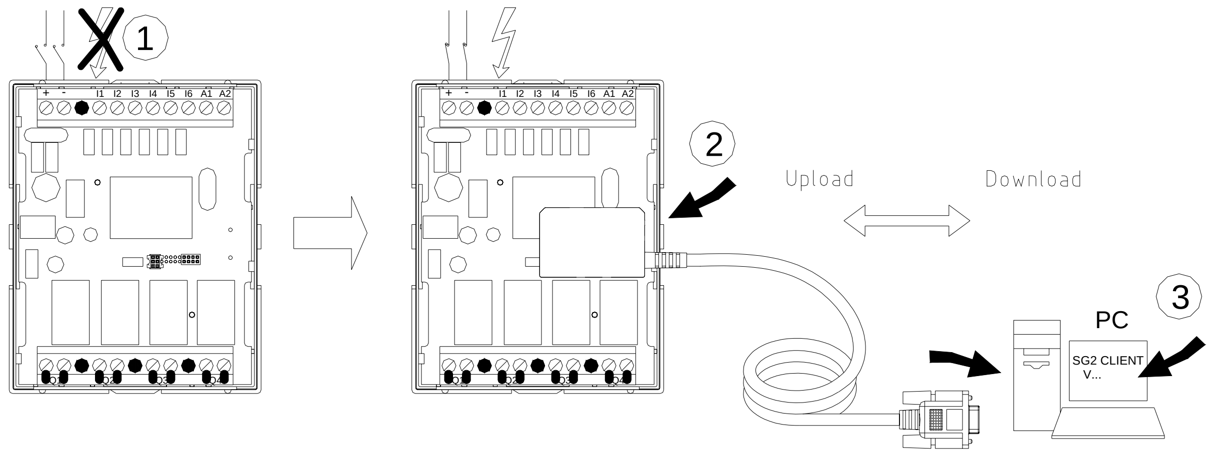
Output (Transistor):



①-1A quick-blowing fuse, circuit-breaker or circuit protector

②-Surge absorber (36V DC)
③-Surge absorber (400V AC)
④-Fuse, circuit-breaker or circuit protector
⑤-Inductive load

Communicate with SG2 CLENT Software:



- Don’t electrify until the CLIENT CABLE is connected.
- Connect the CLIENT CABLE.
- Execute SG2 CLIENT software online.

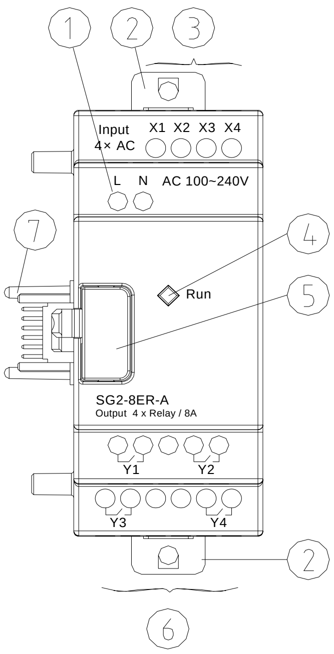
4-2-4 E type

E-TYPE series product

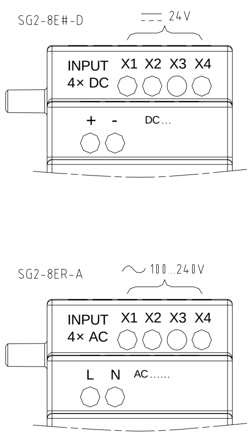
SG2-8ER-D/8ET-D

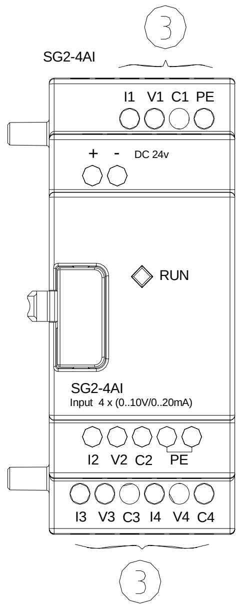
SG2-8ER-A

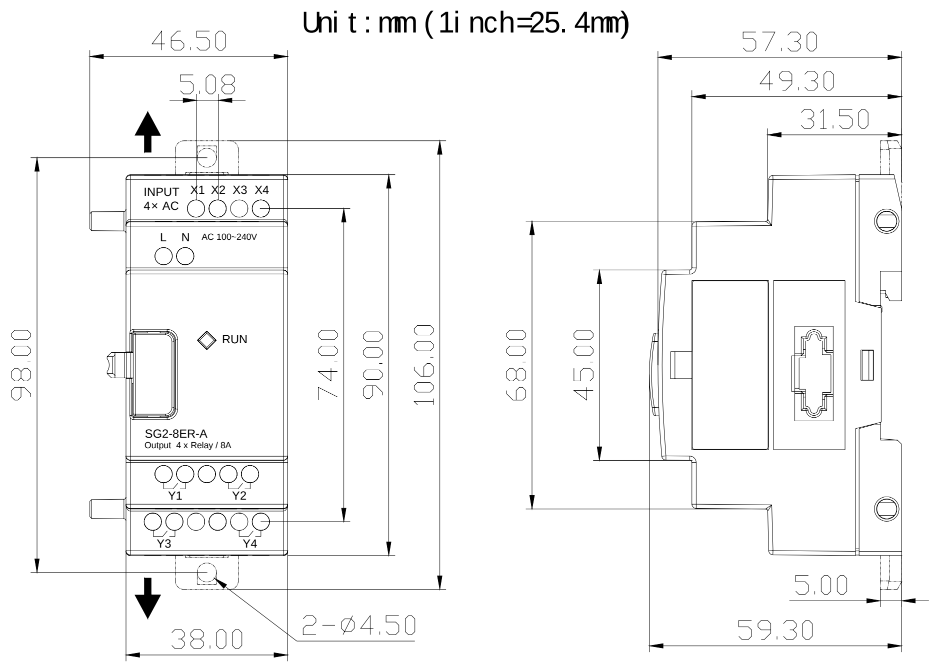
SG2-4AI

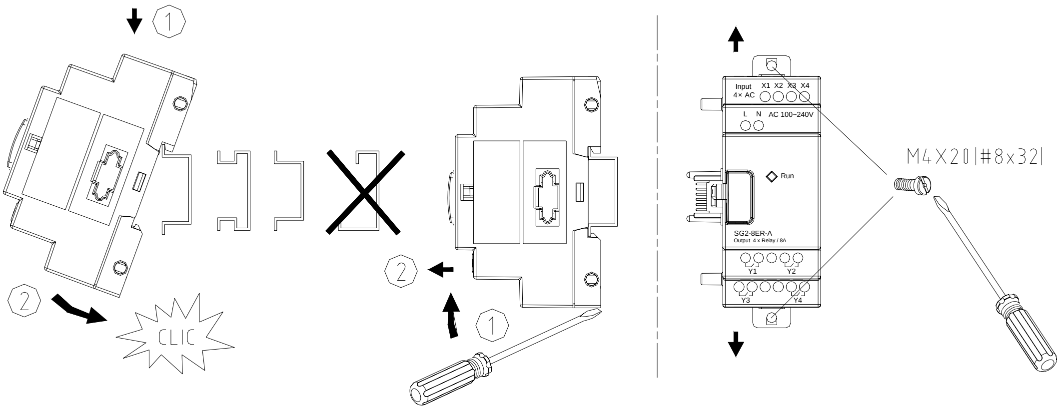


①Power supply terminals
②Retractable mounting feet
③Input terminal
④Voltage/Operating mode green signaling LED
⑤Press-button
⑥Relay output terminals
⑦Connector

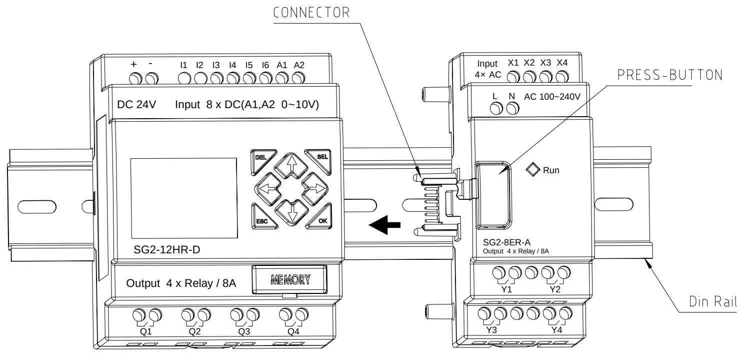




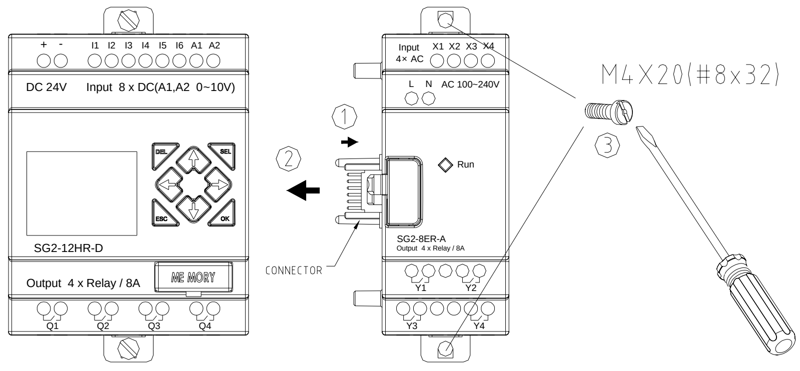




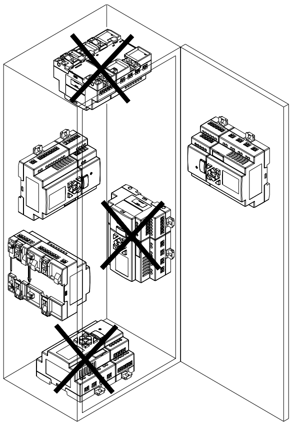
1
2
CLIC
M4X20(#8x32)
Input 4× AC
X1 X2 X3 X4
L N AC 100~240V
Run
SG2-8ER-A
Output 4 x Relay / 8A
Y1 Y2
Y3 Y4



CONNECTOR
PRESS-BUTTON
Din Rail
+ -
I1 I2 I3 I4 I5 I6 A1 A2
DC 24V Input 8 x DC(A1,A2 0~10V)
DEL
SEL
ESC
OK
SG2-12HR-D
Output 4 x Relay / 8A
MEMORY
Q1 Q2 Q3 Q4
Input 4× AC
X1 X2 X3 X4
L N AC 100~240V
Run
SG2-8ER-A
Output 4 x Relay / 8A
Y1 Y2
Y3 Y4



M4X20(#8x32)
1
2
3
CONNECTOR
+ -
I1 I2 I3 I4 I5 I6 A1 A2
DC 24V Input 8 x DC(A1,A2 0~10V)
DEL
SEL
ESC
OK
SG2-12HR-D
Output 4 x Relay / 8A
MEMORY
Q1 Q2 Q3 Q4
Input 4× AC
X1 X2 X3 X4
L N AC 100~240V
Run
SG2-8ER-A
Output 4 x Relay / 8A
Y1 Y2
Y3 Y4

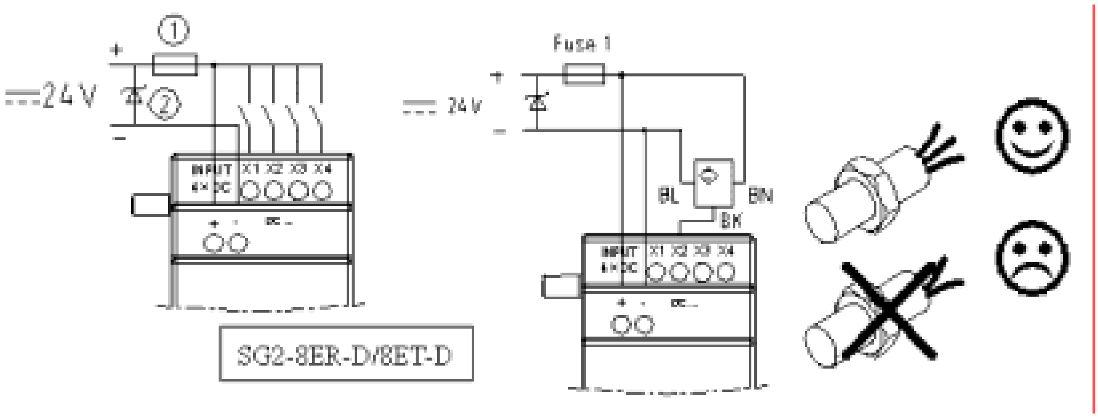


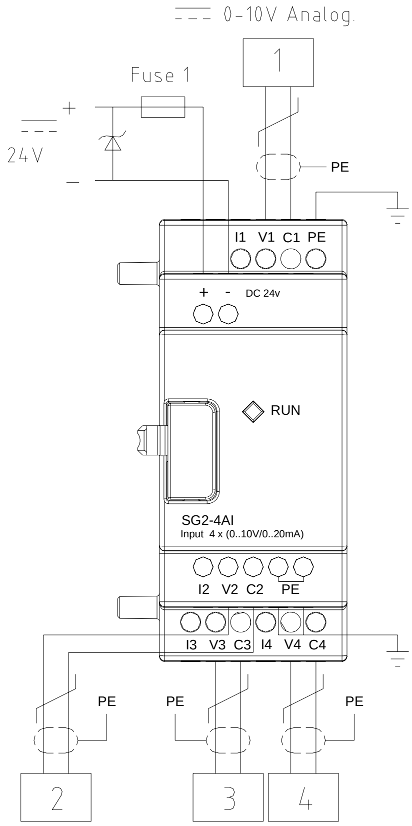
mm²	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

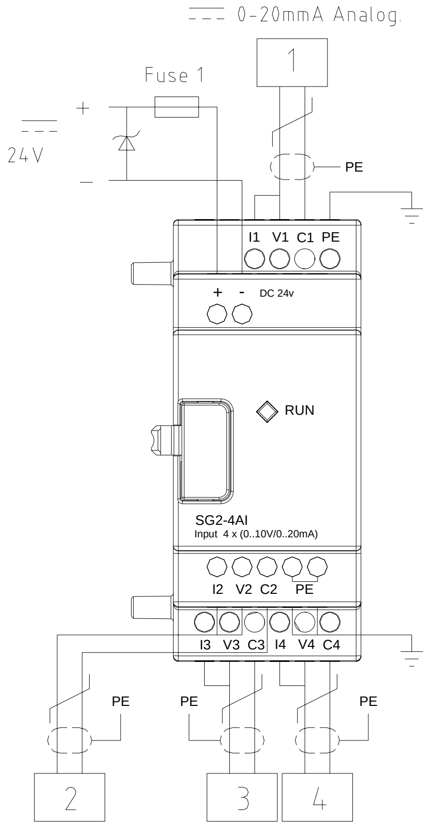
⌀3.5 (0.14in)	C		
	C	Nm	0.6
		lb-in	5.4

Danger:
Cut off all the power supply before maintenance.
Or operator will be damaged for electric shock.

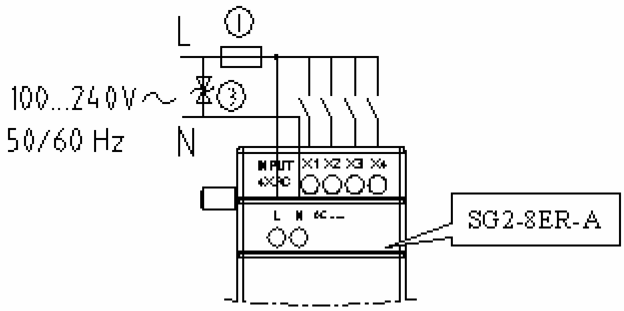
1) **Input 24V DC**



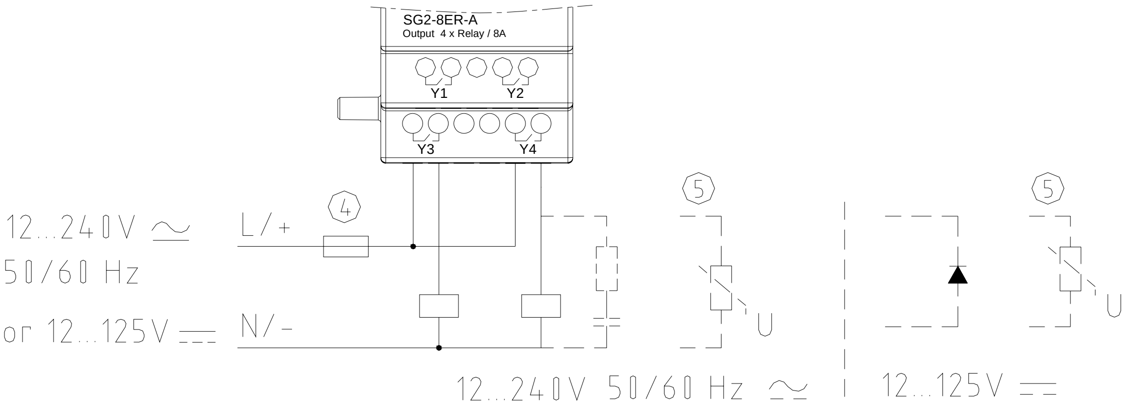




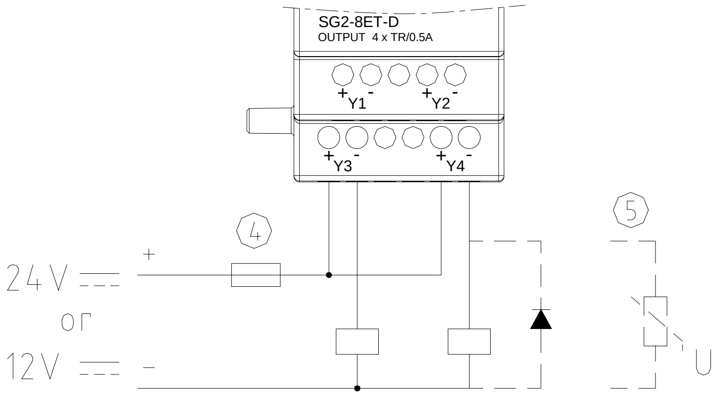
2) Input 100…240V AC:



3) Output (Relay):



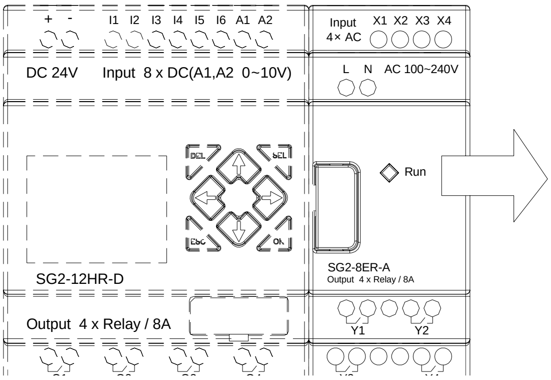
4) **Output (Transistor):**



- 1A quick-blowing fuse, circuit-breaker or circuit protector
- Surge absorber(36V DC)
- Surge absorber(400V AC)
- Fuse, circuit-breaker or circuit protector
- Inductive load

Note: When Relay output connects with AC inductance load, please parallel connect with a surge absorber, while connects with DC inductance load, parallel connect with a rectifying diode with the negative withstand voltage over 5~10 times of the load voltage and positive current over the current of the product. Please select DC power supply for Transistor output model and parallel connect with a rectifying diode for inductance load.

Following is what the LED working in different state means:



◆	Product switched on,module in run mode
◆	Fast flashing (3Hz),module in Fault mode - Date transfer error - Connecting with front error

Chapter 5 Operation Flow

5.1 After Power Supply Connection

(1) ROM-> RAM transmission

◎ Power ON, the embedded EPPROM program and setting parameters will be transmitted to RAM.

(2) Data memory initialization

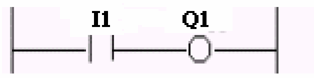
◎ Power on, all the data in memory will be reset initialized. Under RUN mode, when M KEEP parameter is set to ON, the parameters will be memorized as the ones before power off. That is, the data before counter power off will memorized as non-volatile mode is selected. While under STOP mode, M and counter data before power off will not be memorized. When executing the scan for the first time, the input Relay will refresh the data according to input ON/OFF, while the output relay will refresh the data according to operation after executing user program.

（3） Scan Time

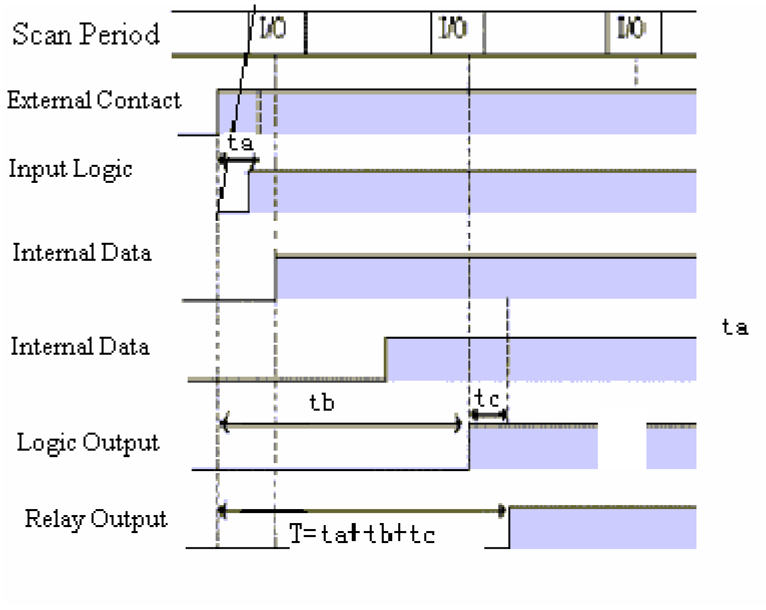
◎ The scan time covers the time for processing input and output data, the process time the operator applied until the final result is obtained.

The scan time is related to the capacity of the Instruction. Under Ladder mode: 5~20mS; Under FBD: 2~10mS

◎ The scan time is related to the user's program capacity. The scan time range is 5~20ms under Ladder edit mode while 2~10ms under FBD mode.



(4) Overall Response Time for SG2 （not including expansion module）



ta: Input OFF -> ON response time

tb: one scan time

tc: Output OFF-> ON response time

5-2 Operation dealing in power loss

Under RUN mode, the present data of counter and the state of the M coil will be memorized as power off.

5-3 RUN－STOP－RUN operation

RUN－STOP, present output will be cut and the present value of function block and state of the coils will be cleared.

However, the present data will not be cleared as C Keep is selected and counter mode is set to 3, 4, 6.

Content

Chapter 6 LADDER Instruction Description

6-1 Basic Instruction

6-1-1 Instructions with logical operand

	[General output	⮝ SET output	⮟ RESET output	P PULSE output	─┤├─ Normal open contact	─┤/├─ Normal close contact	Number
Input coil					I	i	12 (I1~IC / i1~iC)
Output coil	Q	Q	Q	Q	Q	q	8 (Q1~Q8 / q1~q8)
Auxiliary coil	M	M	M	M	M	m	15 (M1~MF / m1~mF)
Expand input coil					X	x	12 (X1~XC /x1~xC)
Expand output coil	Y	Y	Y	Y	Y	y	12 (Y1~YC / y1~yC)
RTC	R				R	r	15 (R1~RF / r1~rF)
Counter	C				C	c	15 (C1~CF / c1~cF)
Timer	T			T	T	t	15 (T1~TF / t1~tF)
Analog comparator	G				G	g	15 (G1~GF / g1~gF)
HMI	H						15 (H1~HF)
PWM	P						1 (P1)
I/O LINK	L						8 (L1~L8)

6-1-2 Instructions without operand

D Up differential	d Down differential	“ ” Open circuit	“ -- ” Short circuit

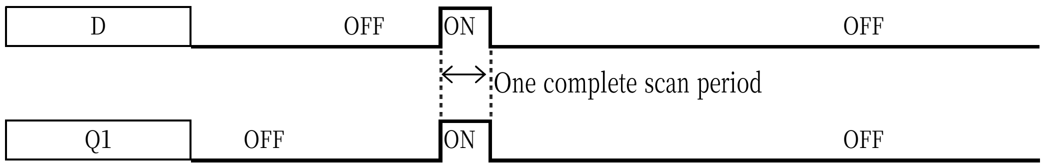
6-1-3 Connection signal

— connect with left and right components	⊥ connect with left, right and up components	┼ connect with left, right, up and down components	┬ connect with left, right and down components

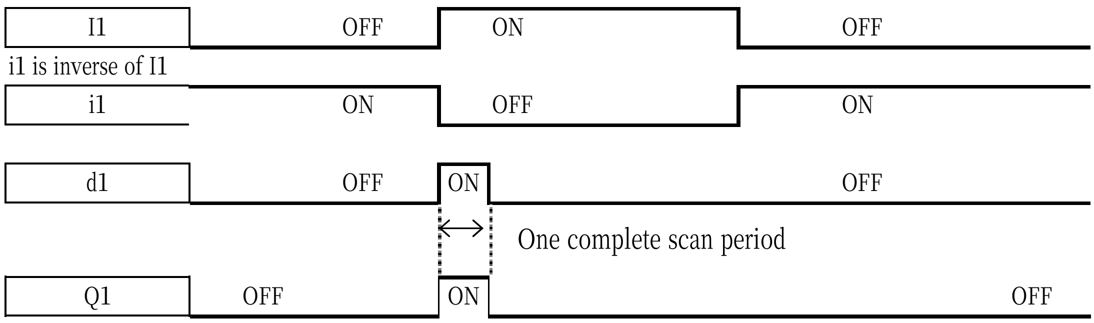
6-2 Example for basic instruction

◎ Function D (d) Instruction

1： I1—D ———[Q1

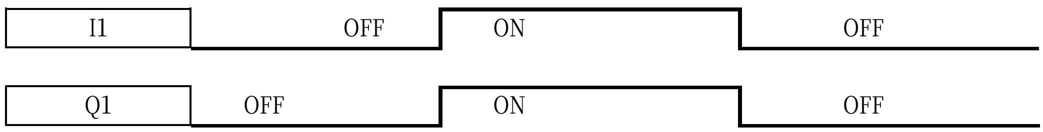


2： i1—d——[Q1



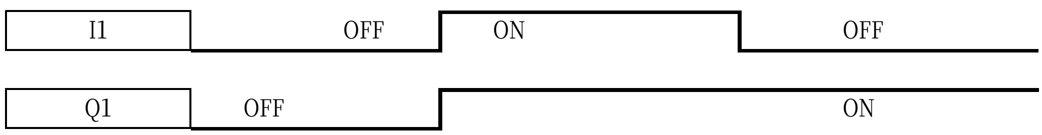
◎ NORMAL(-[ ) Output

I1———[Q1

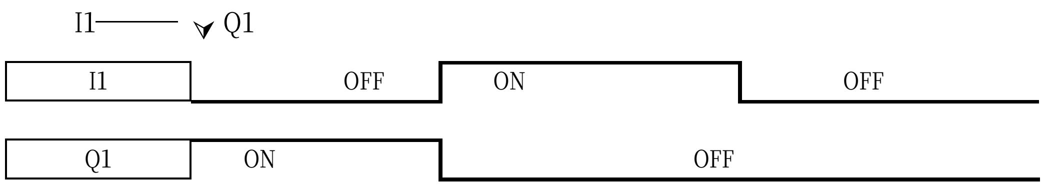


◎ SET（▲）Output

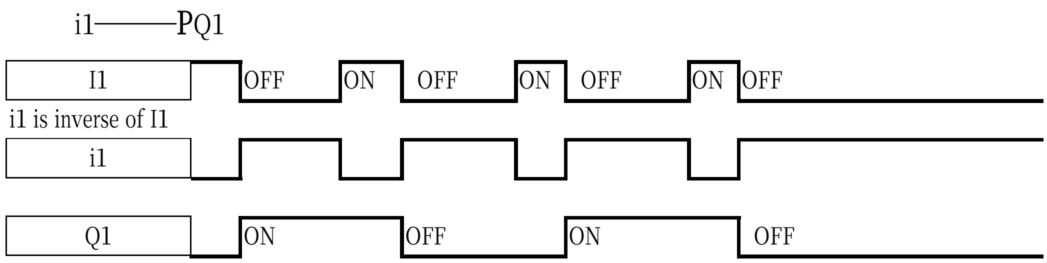
I1——— ▲ Q1



◎ RESET（⊻）Output

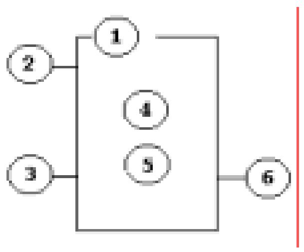


◎ P Output



6-3 Function Block

6-3-1 General Counter



Symbol	Description
①	Counting Mode (1- 8)
②	Use (I1 ~ gF) to set counting up or counting down OFF: counting up (0, 1, 2, 3, 4···.) ON: counting down (···.3, 2, 1, 0)
③	Use (I1 ~ gF) to RESET the counting value ON: the counter reset to zero and ⑥ OFF OFF: the counter continues to count
④	Present Counting Value, range:0~999999
⑤	Target (Setting) Value, range:0~999999
⑥	Code of the counter (C1 ~ CF total: 15 groups).

Note：

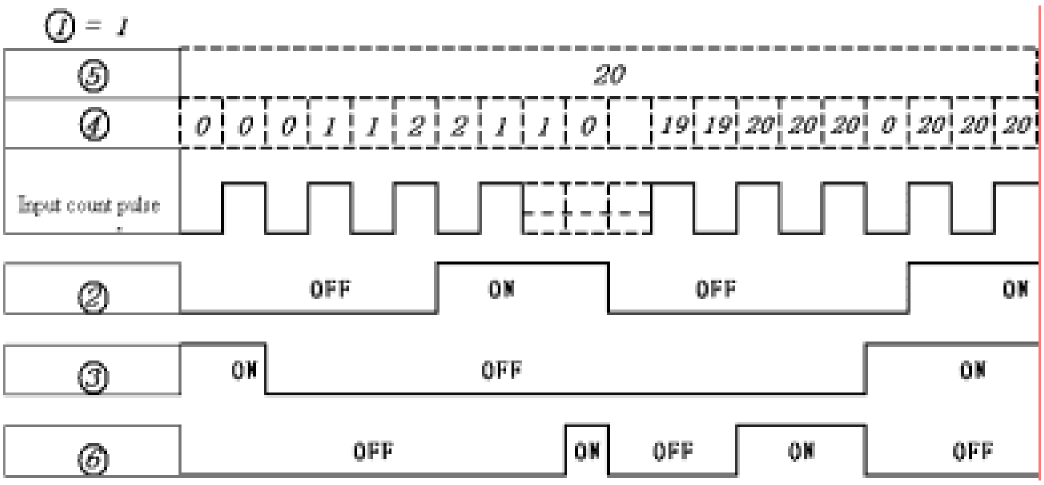
※ The setting value of the counter could be a constant or the present value of the timer, counter， analog input A1~A8.

※Foer I1~gF, Input terminal: I1~IC (I1~I12), Output terminal: Q1~Q8, Expansion Input Terminal: X1~XC (X1~X12), Expansion Output Terminal: Y1~YF (Y1~Y12), Counter: C1~CF (C1~C15), Timer: T1~TF (T1~T15), RTC Comparator: R1~RF (R1~R15) , Analog Comparator: G1~GF (G1~G15),Auxiliary Terminal:M1~MF（M1~M15）.

The upper case (I1) is Contact ‘ a ’ while the lower (i1) case is Contact ‘ b ’.

※ The set value of counter can be modified via communication module as MODBUS, PROFIBUS, DEVICENET, TCP/IP.

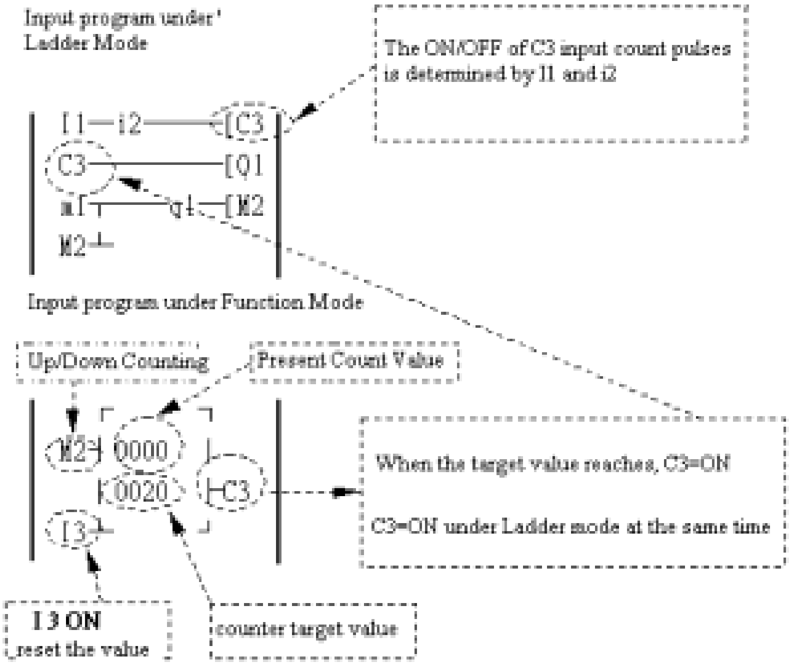
(1) Counter Mode 1



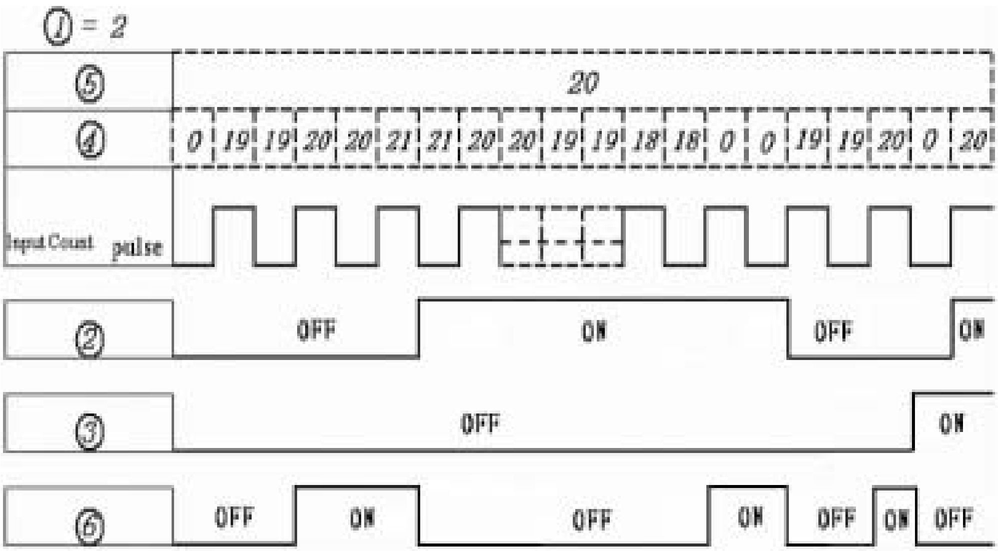
Note：

※ When Run user program, current value shall be initialized to be 0 or preset value.(If up counter, then 0; if down counter, then preset value)

Example：



(2) Counter Mode 2



Note:

※ a. Under this Mode, the counting present value appeared will be greater than 20, unlike the Mode 1 in which the value is locked at 20.

b. The present value of counter will be reset to initial (default) value at the time of power ON or switching RUN/STOP. (That is, the present value of counter is 0 in counting up, while it is preset value in counting down).

(3) Counter mode 3

Similar to mode 1, except for:

a. Under this mode, the present value of the counter will be memorized as power loss at Run state.

b. Under this mode, C keep function selected, the present value of the counter will be memorized when Run/Stop switching.

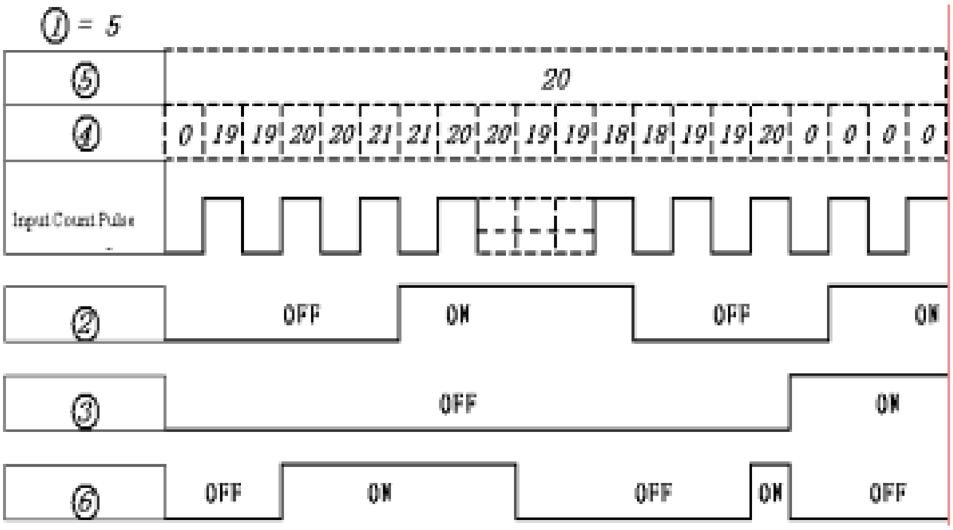
(4) Counter mode 4

Similar to mode 2, except for:

a. Under this mode, the present value of the counter will be memorized as power loss at Run state.

b. Under this mode, C keep function selected, the present value of the counter will be memorized when Run/Stop switching.

(5) Counter Mode 5



Note:

a.Under this Mode, the counting present value appeared will be greater than 20, unlike the Mode 1 in which the value is locked at 20. If reset is available, the present value will reset to 0, unrelated with the counting direction.

b. When reset is enabled, the present value is always 0 regardless of counting direction.

c. When Run/Stop switching, the present value is always 0 regardless of counting direction.

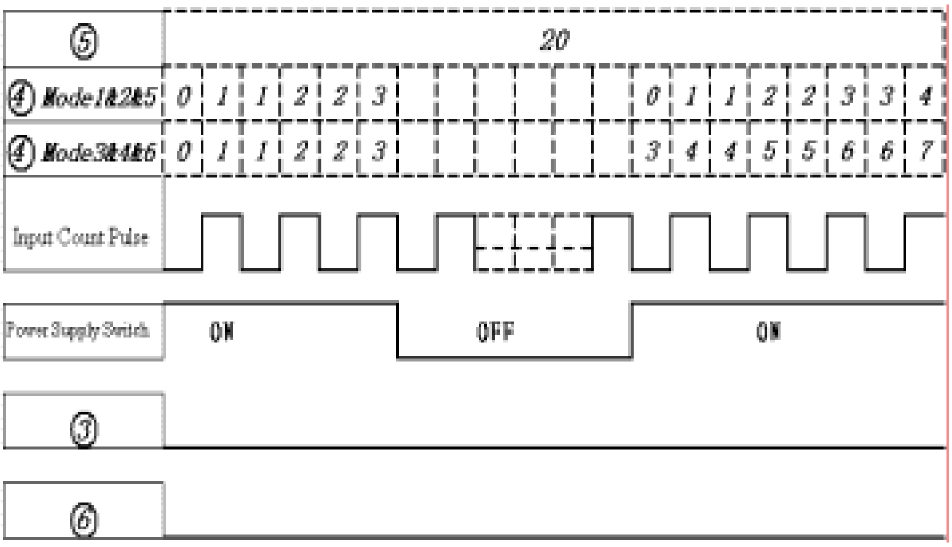
(6) Counter mode 6

Similar to mode 5, except for:

a. Under this mode, the present value of the counter will be memorized as power loss at Run state.

b. Under this mode, C keep function selected, the present value of the counter will

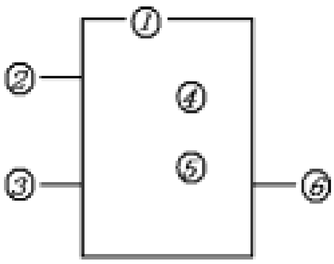
be memorized when Run/Stop switching.



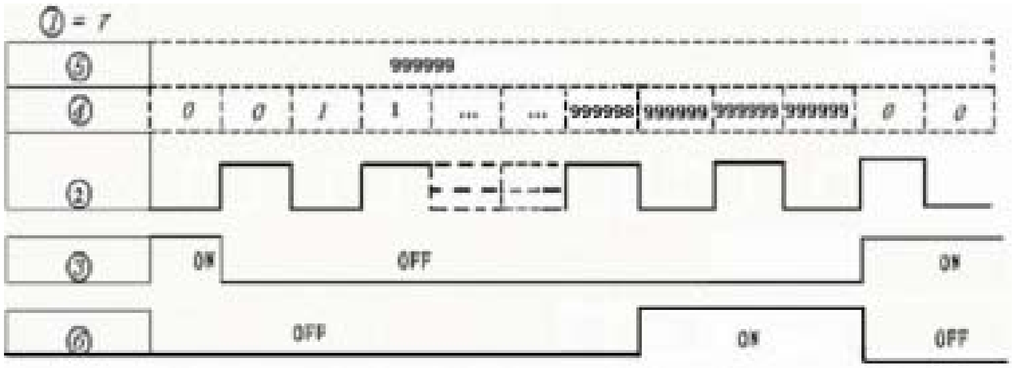
◎High Speed Counter (Only Provide for DC Power Supply)

DC power supply type has two 1 KHz High speed input terminals, I1 and I2. Two groups of high-speed counting function is available with these two counters.

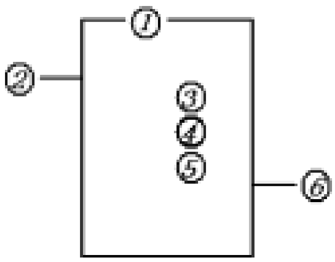
(1) Counter Mode 7



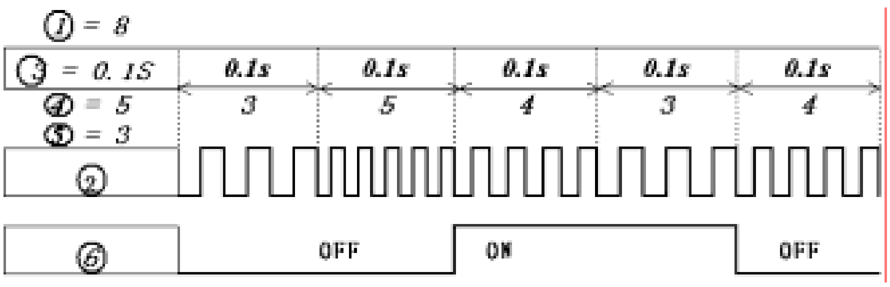
Symbol	Description
①	Counting mode(7)—high speed counting
②	High speed counting input terminal: only I1, I2 available.
③	Use I1~gF to reset counting value. ON: counter is reset to zero and ⑥OFF OFF: counter continues to count.
④	Counter present value: 0~999999
⑤	Counter target value: 0~999999
⑥	Code of Counter (C1~CF Total :2/15Group, only 2 Groups is available for mode 7, but the counter code is not limited)



(2) Counter mode 8



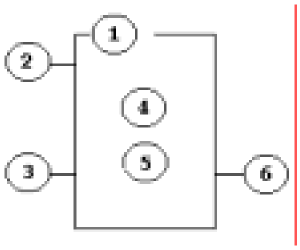
Symbol	Description
①	Counting Mode(8)—Frequency Comparison
②	High speed counting input terminal: only I1, I2 available.
③	Counting interval time:(0~99.99S)
④	Counter ‘ on ’ target value (000000~999999)
⑤	Counter ‘ off ’ target value (000000~999999)
⑥	Code of Counter (C1~CF Total :2/15Group, only 2 Groups is available for mode 8, but the counter code is not limited)



Note：

As show in the diagram, the output will be delayed for one interval.

6-3-2 Timer



Symbol	Description
①	Timer Mode (1-7)
②	Timer Unit：1：0.00~99.99s 2：0.0~999.9s 3：0~9999s 4：0~9999m
③	Use I1~gF to reset the timer value. ON ：timer value is reset to Zero and ⑥ OFF OFF ：timer continues to timing
④	Timer present value
⑤	Timer target value
⑥	Code of timer (T1~TF total: 15Group)

Note：

※ The setting value of the timer could be constant, or the present value of the timer, counter or analog input of A1~A8.

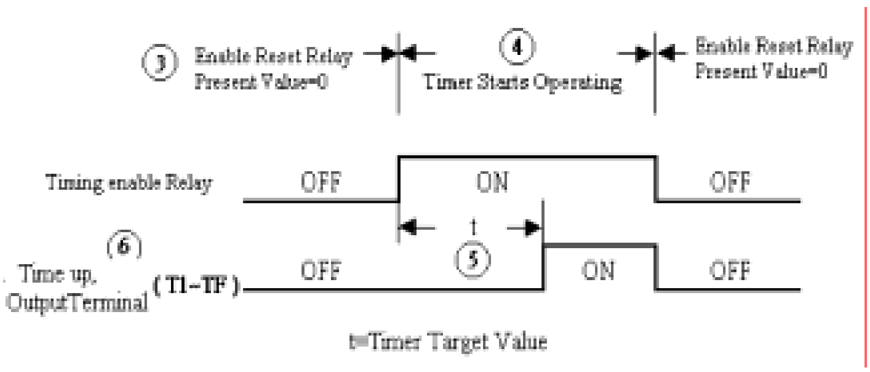
※ For I1~gF, input terminal:I1~IC(I1~I12),output terminal: Q1~Q8,expansion input terminal:X1~XC(X1~X12),expansion output terminal: Y1~YF(Y1~Y12), Counter :C1~CF(C1~C15),Timer :T1~TF(T1~T15) , RTC Comparator: R1~RF(R1~R15) , analog Comparator: G1~GF(G1~G15),Auxiliary terminal: M1~MF

（M1~M15）.

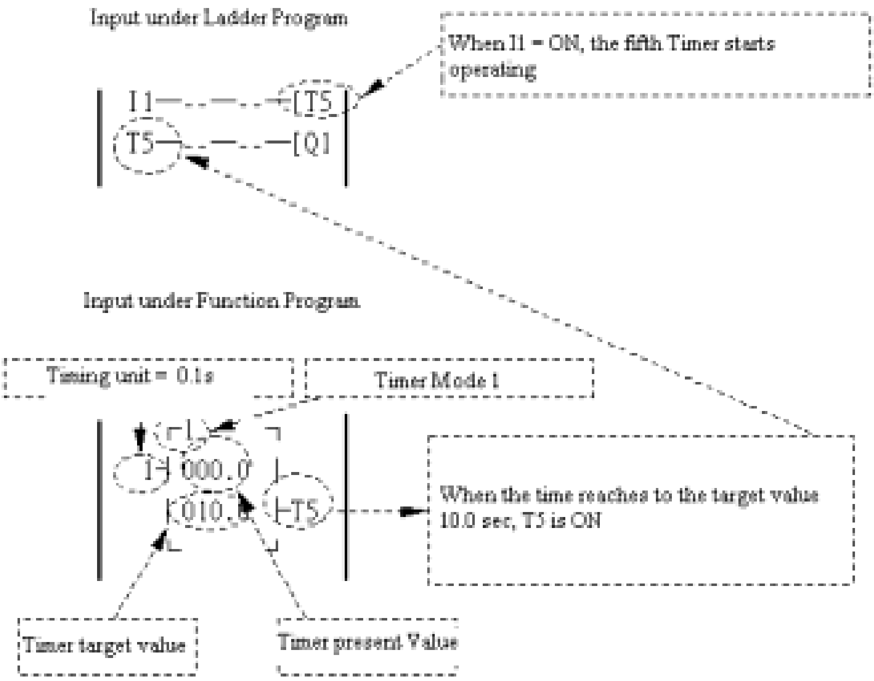
The upper case (I1) is Contact ‘a’ while the lower (i1) case is Contact ‘b’.

※The set value of timer can be modified via communication module as MODBUS, PROFIBUS, DEVICENET, TCP/IP.

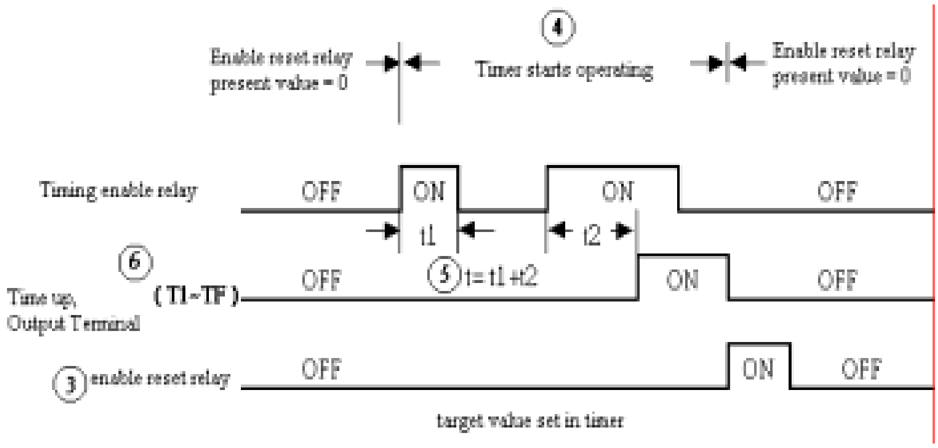
(1) Timer Mode 1(ON-Delay A mode)



Sample:

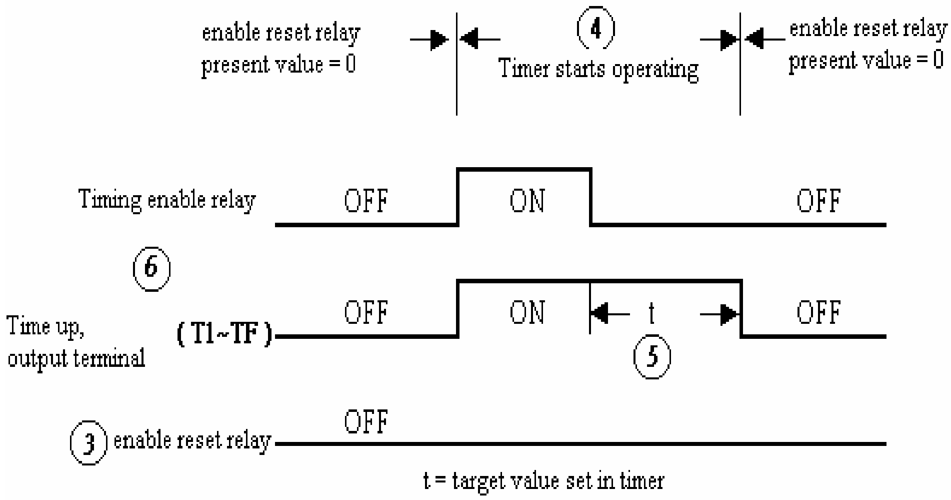

Input under Ladder Program
When I1 = ON, the fifth Timer starts operating
I1
[T5]
T5
[Q1]
Input under Function Program
Timing unit = 0.1s
Timer Mode 1
1
I1
000.0
010.0
T5
When the time reaches to the target value 10.0 sec, T5 is ON
Timer target value
Timer present Value

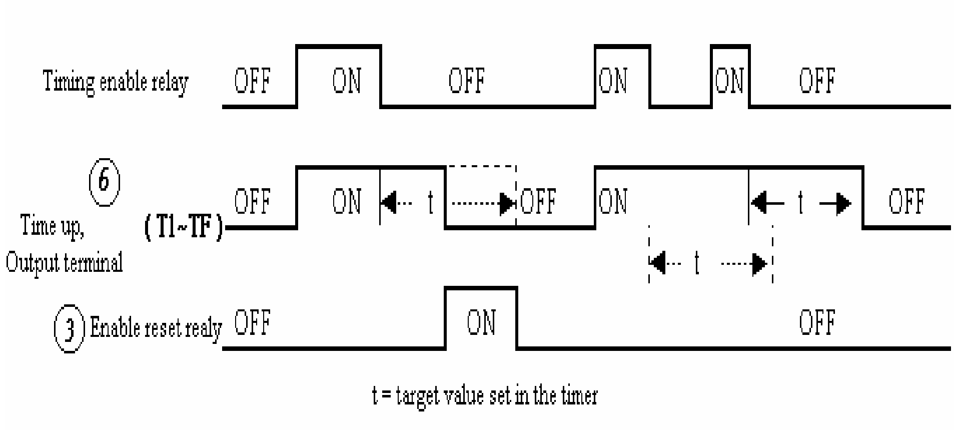
(2) Timer mode 2(ON-Delay B mode)



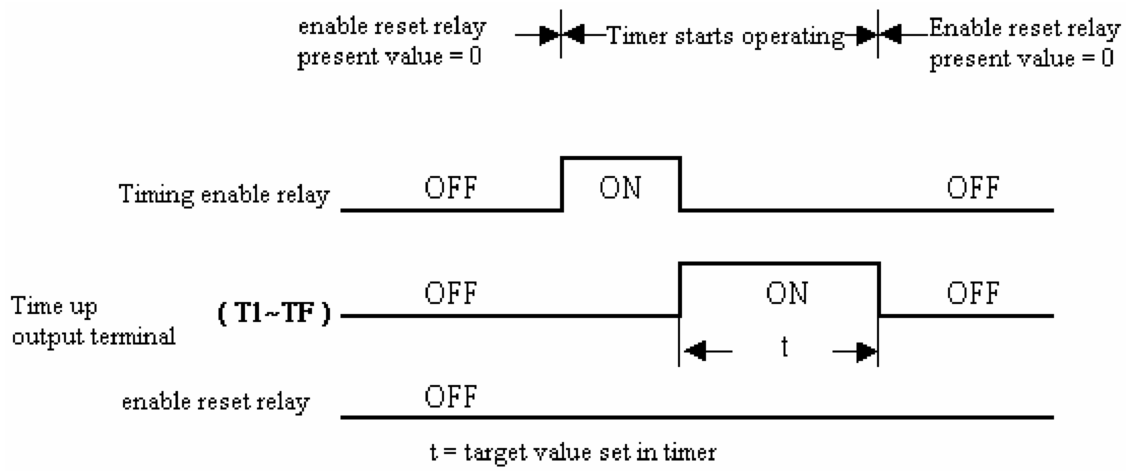
Note: timing begins, the action time of the Relay less than the Minimum unit, will be neglected.

(3) Timer Mode 3(OFF-Delay A Mode)

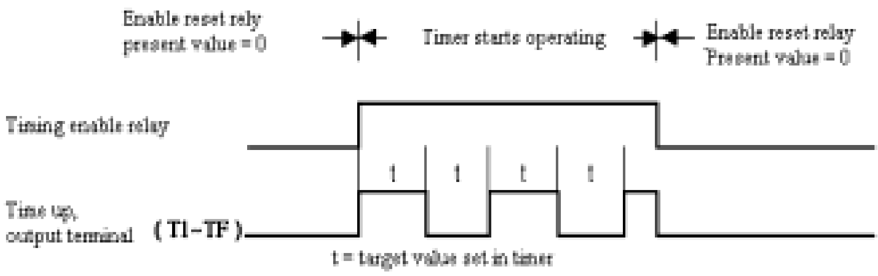




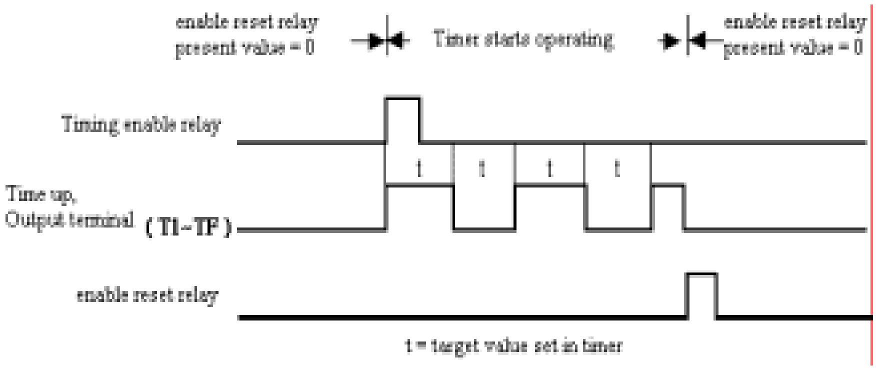
(4) Timer Mode 4(OFF-Delay B Mode)



(5) Timer Mode 5(FLASH A Mode)

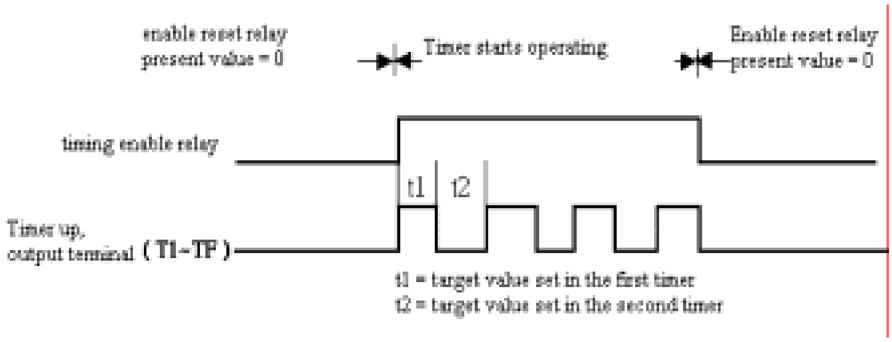


(6) Timer Mode 6(FLASH B Mode)



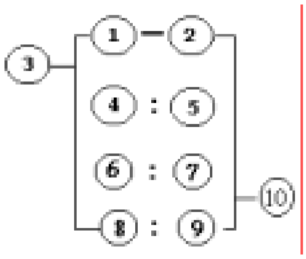
(7) Timer Mode 7(FLASH C Mode)

※ Note: This is rather special Mode which series connects two timer, t1 and t2. In addition, add PTn, where n=1, 2, 3, 4, ……, E. but Tn + 1 Timer can not be used for other purpose. Sample : I1--------PT1 , t1=T1 Target value；t2=T2 Target value.



6-3-3 RTC Instruction

★ Weekly Mode

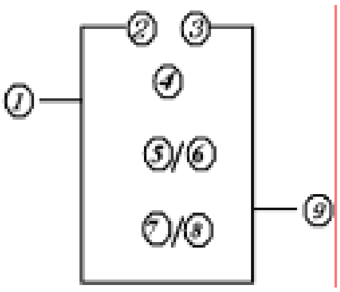


Symbol	Description
①	Input the first week to RTC
②	Input the second week to RTC
③	RTC mode(1~2) 1:daily ,2:consecutive days
④	RTC displays the hour of present time.
⑤	RTC displays the minute of present time
⑥	Set RTC hour ON
⑦	Set RTC Minute ON
⑧	Set RTC Hour OFF
⑨	Set RTC Minute OFF
⑩	Code of RTC (R1~RF Total: 15Group)

※Description for Week Code：Monday ~Sunday=MO , TU , WE , TH , FR , SA , SU

※ The set value of RTC can be modified via communication module as MODBUS, PROFIBUS, DEVICENET, TCP/IP.

★ Year-Month-Day Mode

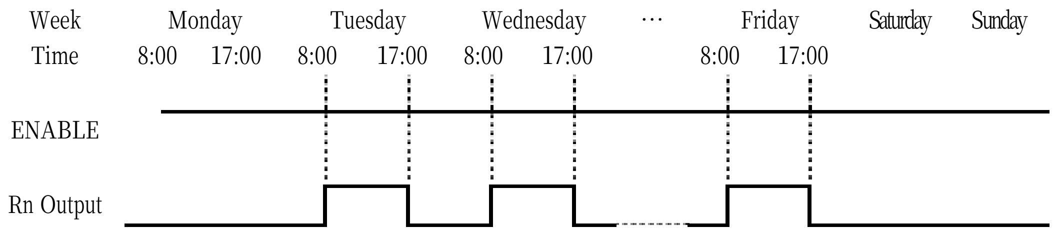


Symbol	Description
①	RTC mode 3, Year-Month-Day
②	Setting RTC Year ON
③	Setting RTC Year OFF
④	Display RTC Present time: Year-Month-Day
⑤	Setting RTC month ON
⑥	Setting RTC Day ON
⑦	Setting RTC month OFF
⑧	Setting RTC Day OFF
⑨	RTC Code (R1~RF, total 15 group)

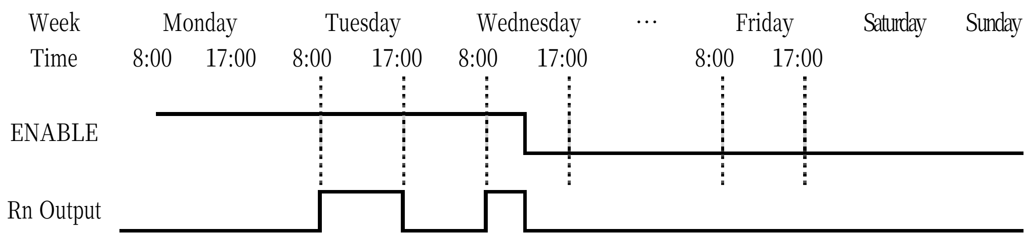
(1) RTC Mode 1

Sample 1：

③	1
① ：②	TU-FR
⑥ ：⑦	08:00
⑧ ：⑨	17:00

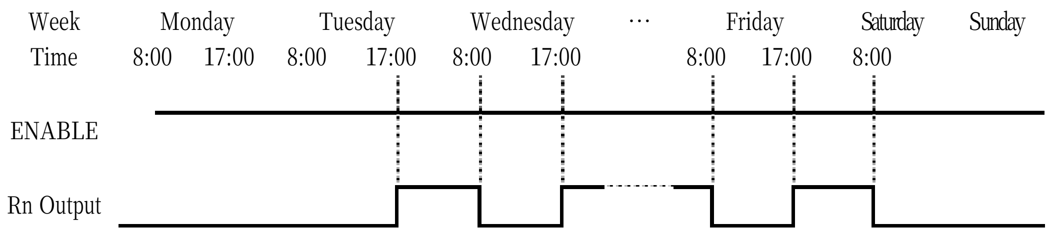


** Note：If ENABLE fails, output is OFF.



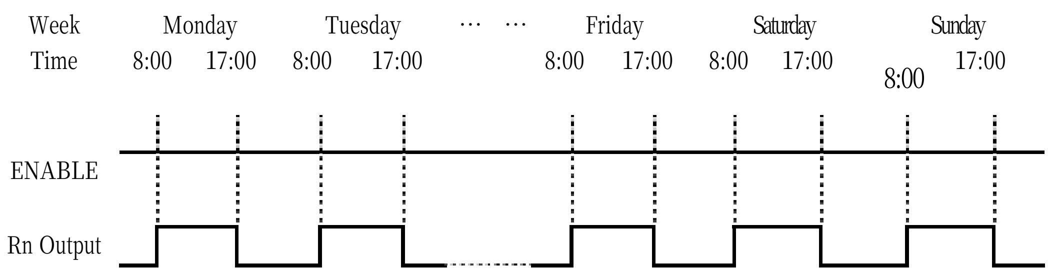
Sample 2：

③	1
① ：②	TU-FR
⑥ ：⑦	17:00
⑧ ：⑨	8:00



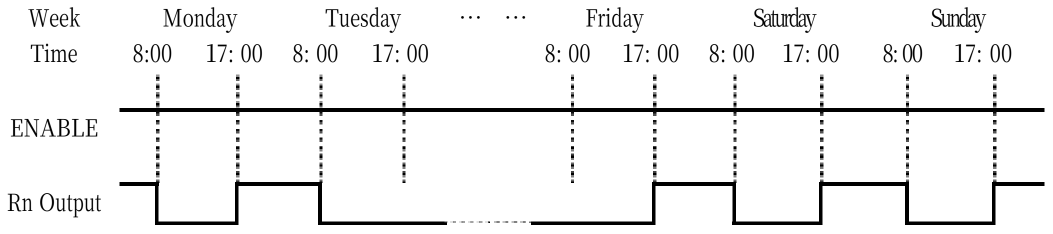
Sample 3：

③	1
① ：②	FR-TU
⑥ ：⑦	08:00
⑧ ：⑨	17:00



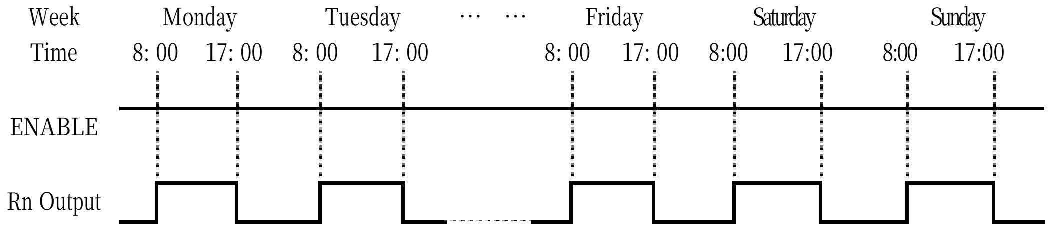
Sample 4：

③	1
① ：②	FR-MO
⑥ ：⑦	17:00
⑧ ：⑨	8:00



Example 5：

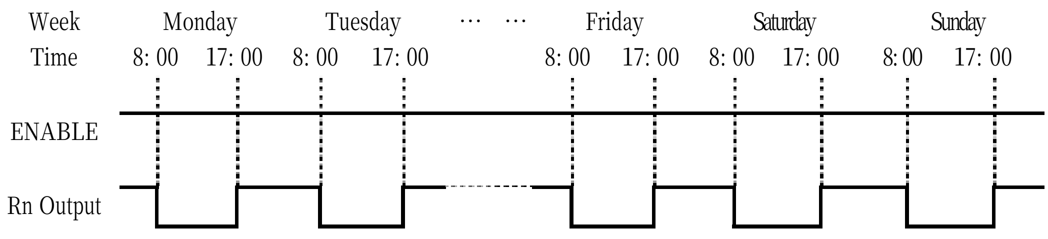
③	1
① ：②	SU-SU
⑥ ：⑦	08:00
⑧ ：⑨	17: 00



Example 6:

③	1

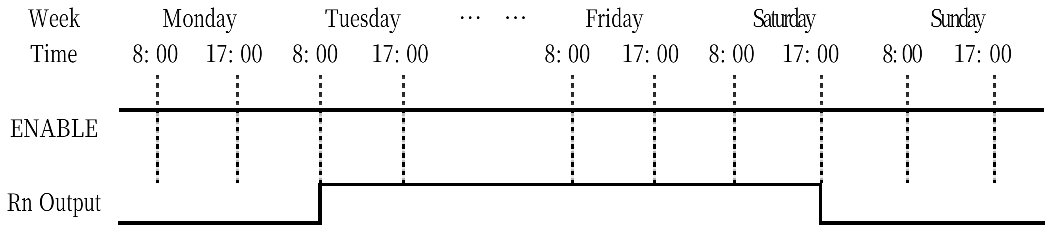
① ：②	SU-SU
⑥ ：⑦	17: 00
⑧ ：⑨	8: 00



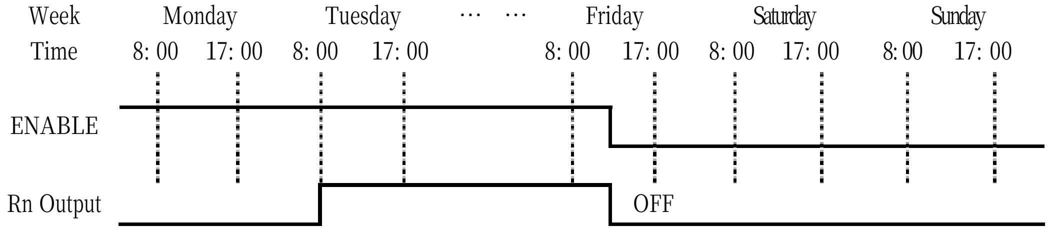
(2) RTC Mode 2

Example 1：

③	2
① ：②	TU-SA
⑥ ：⑦	08: 00
⑧ ：⑨	17: 00

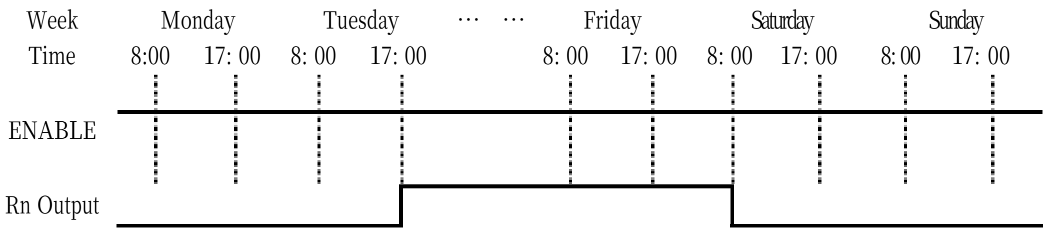


** Note: When ENABLE is unavailable, the output is OFF.



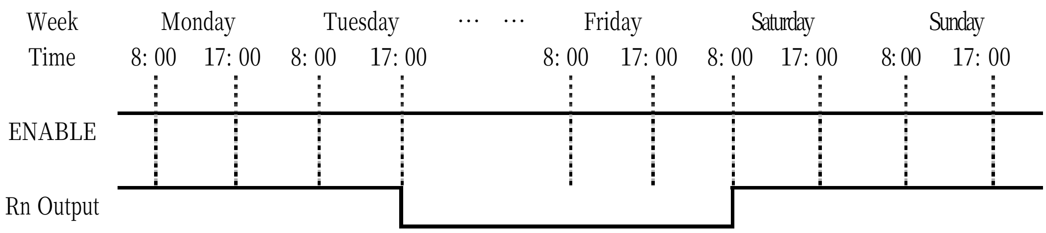
Example 2：

③	2
① ：②	TU-SA
⑥ ：⑦	17:00
⑧ ：⑨	08:00



Example 3：

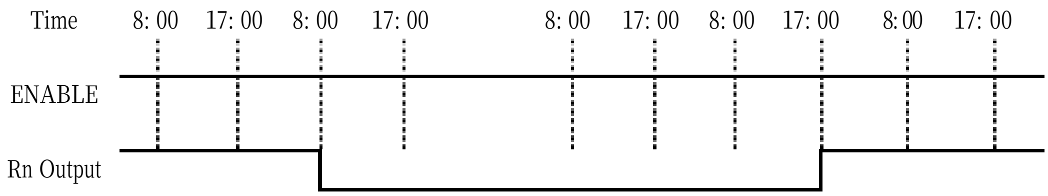
③	2
① ：②	SA-TU
⑥ ：⑦	08: 00
⑧ ：⑨	17: 00



Example 4：

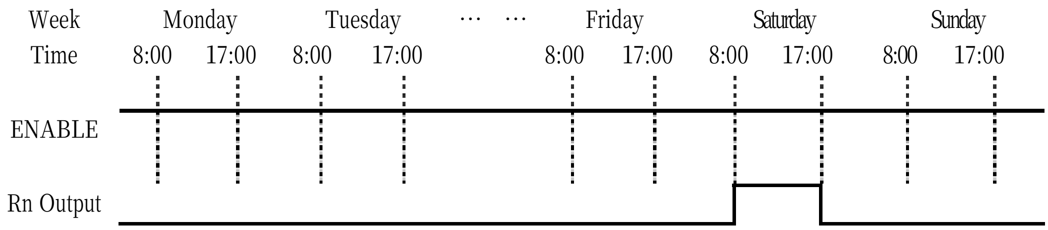
③	2
① ：②	SA-TU
⑥ ：⑦	17: 00
⑧ ：⑨	08: 00

Week Monday Tuesday … … Friday Saturday Sunday



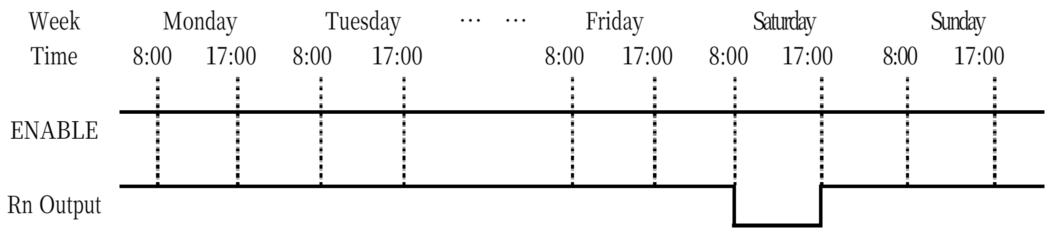
Sample 5：

③	2
① ：②	SA-SA
⑥ ：⑦	08:00
⑧ ：⑨	17:00



Sample 6：

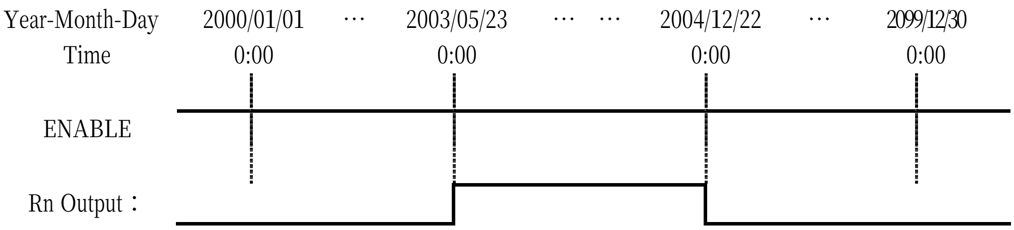
③	2
① ：②	SA-SA
⑥ ：⑦	17:00
⑧ ：⑨	08:00



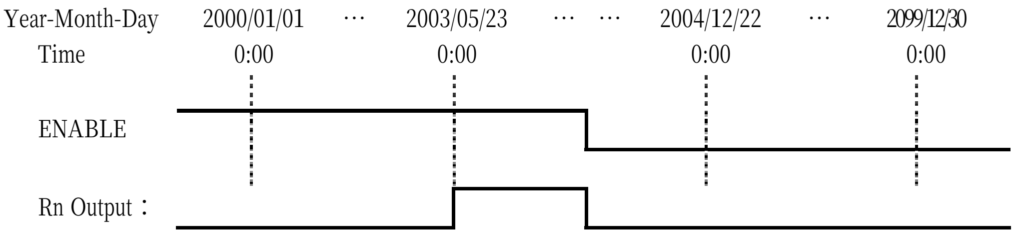
(3) RTC Mode 3

Sample 1：

①	3
② / ⑤ / ⑥	03/05/23
③ / ⑦ / ⑧	04/12/22

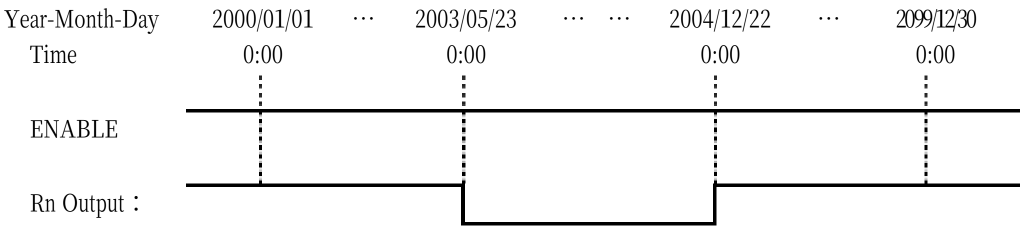


** Note：If ENABLE fails, the output will be OFF.



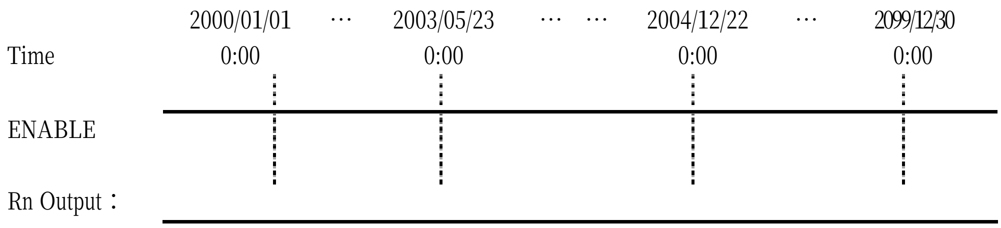
Sample 2：

①	3
② / ⑤ / ⑥	04/12/22
③ / ⑦ / ⑧	03/05/23

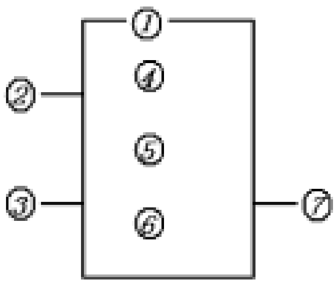


Sample 3：

①	3
② / ⑤ / ⑥	03/05/23
③ / ⑦ / ⑧	03/05/23



6-3-4 Analog Comparator



Symbol	Description
①	Analog Comparison Mode(1~5)
②	A_X analog input (A1~A8), or the present value of the timer, counter.
③	A_Y analog input (A1~A8), or the present value of the timer, counter.
④	A_X analog input value(0.00~9.99)
⑤	A_Y analog input value (0.00~9.99)
⑥	Set reference comparative value: could be constant, or the present value of the timer, counter and analog input.
⑦	Output terminal(G1~GF)

※The ON or Off of analog output terminals (G1~GF) is determined by the comparison of the analog inputs of Ax and Ay.

※The set value of analog comparator can be modified via communication module as MODBUS,

PROFIBUS, DEVICENET, TCP/IP.

When the relay of analog comparator is ON, there are 5 operation modes described below:

(1) Analog Comparator mode1 (A_Y - ⑥ ≤ A_X ≤ A_Y +⑥, ⑦ ON)

(2) Analog Comparator mode 2 ($A_X \le A_Y$, ⑦ ON)

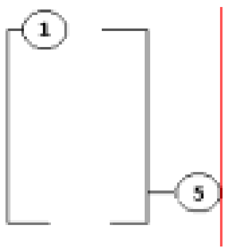
(3) Analog Comparator mode3 ($A_X \ge A_Y$, ⑦ ON)

(4) Analog Comparator mode4 (⑥ ≥ A_X, ⑦ ON)

(5) Analog Comparator mode5 (⑥ ≤ A_X, ⑦ ON)

6-3-5 HMI File

This function block ,12╳4 can display the information as word information, present value and target value counter, timer, RTC and Analog comparator. Under running mode, to modify the target value of timer, counter and analog comparator via HMI is available. HMI can display the status of input terminal (I, X) and Auxiliary terminal M, N.



Symbol	Description
①	Display mode（1~2）
⑤	HMI character output terminal (H1~H8)

(1) Display mode could be changed via the keys, first page displays =1, first page doesn’t display = 2.

＊The displayed information can be only input by means of Client Software. Under running mode, to modify the preset value of the timer, counter, RTC and analog comparator is available via HMI of the controlled equipments.

How to use HMI function in SG2 client software will be described in detail, here.

◎Under FBD mode:

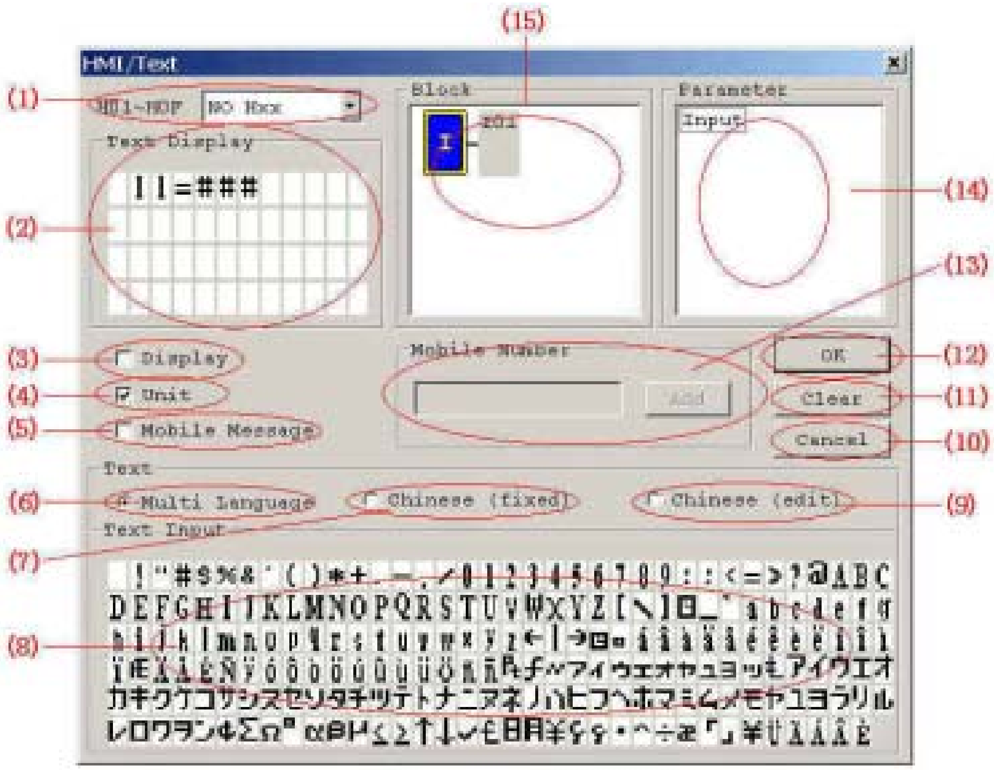
1. Open the text editor. All the components available to text are listed in Function Block Table of the text editor.

2. To select the component in Function Block Table that lists all the editable parameter of the certain component.

3. To select the parameter in the list, the information with corresponding format will be input the LCD of emulator.

4. To press the 'OK' button after editing text finished, the data is all saved in the Hxx component function block.

For example:



Description:

(1) To select text Hxx (H01-H0F). If there is no HMI (Text)Block in program ,'NO Hxx' will be displayed here.

(2) Text display on LCD;

(3) When the Display is enabled, the user can press the SEL button for 3 seconds to show the HMI (Text) Messages

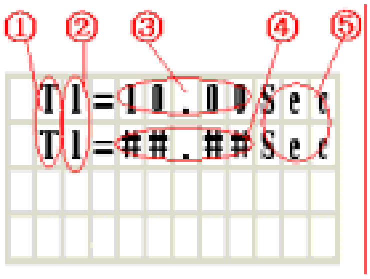
(4) To select the 'Unit', the input parameter includes Unit (with Unit display). Or the parameter displayed has no Unit (without Unit display).

Example :

1. To select the 'Unit (with Unit display)

Under this condition, both preset value and current value can be displayed at same time.

A, Timer: operation mode 1(output delay). Text display as follow.



Description:

① Function Type

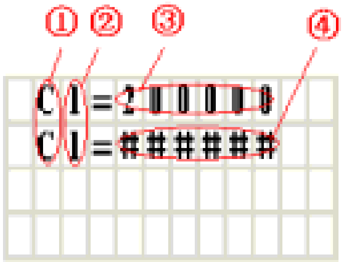
② Number

③ Preset Value

④ Current Value

⑤ Unit

B, Counter: Operation mode 1.   Text display as follow.



Description:

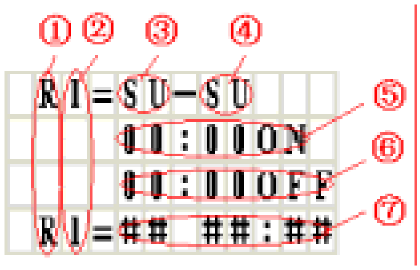
① Function Type

② Number

③ Preset Value

④ Current Value

C, RTC mode 1 OR mode 2. Text display as follow.



Description:

① Function Type

② Number

③ Preset Value (Start Week)

④ Preset Value (End Week)

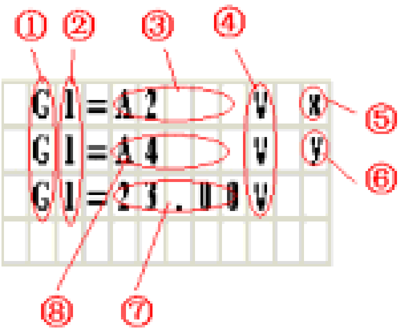
⑤ Preset Value (Start time Hour: Minute)

⑥ Preset Value (End time Hour: Minute)

⑦ Current Value (Week, Hour, Minute)

格式化: 項目符號及編號

D. Analog Comparator .Text display as follow.



Description:

① Function Type

② Number

③ Preset Value

④ Unit

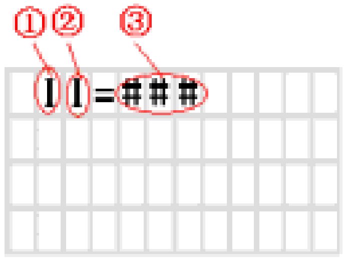
⑤ Input Ax

⑥ Input Ay

⑦ Preset Value

⑧ Preset Value

E. Ixx (input contact).Text display as follow.



Description:

① Function Type

② Number

③ Current Status(ON/OFF)

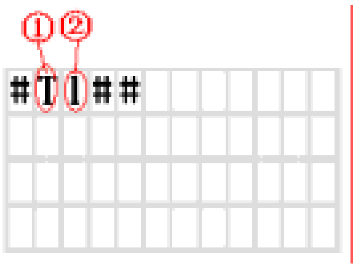
Note: Mxx (Auxiliary output function block), Nxx (auxiliary output function block) is similar to Ixx.

2. Not select the 'Unit'(without Unit display)

Under this condition, only the current information of Function Block is displayed.

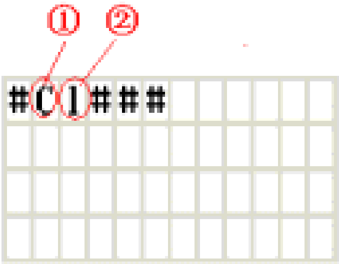
* RTC is an exception, it still has Unit.

A. Timer .Text display as follow.



Description:
① Function Type
② Number

B. Counter, Counter mode 1.Text display as follow.

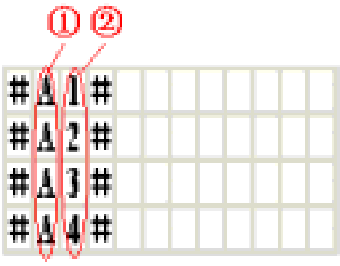


Description:

① Function Type

② Number

C. Analog comparator .Text display as follow.



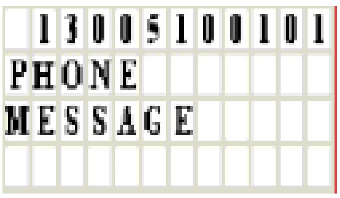
Description:

① Function Type

② Number

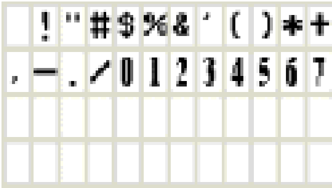
(5) To select 'Mobile Message'. Hxx displays the mobile number message only. Can’t call out automatically

The first line displays input numeral, while the other 3 lines display the Mobile message.



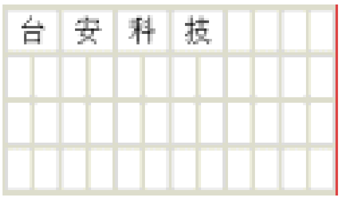
(6) To enable 'Multi Language' to display Multi languages to choose in the character input column.

Sample:



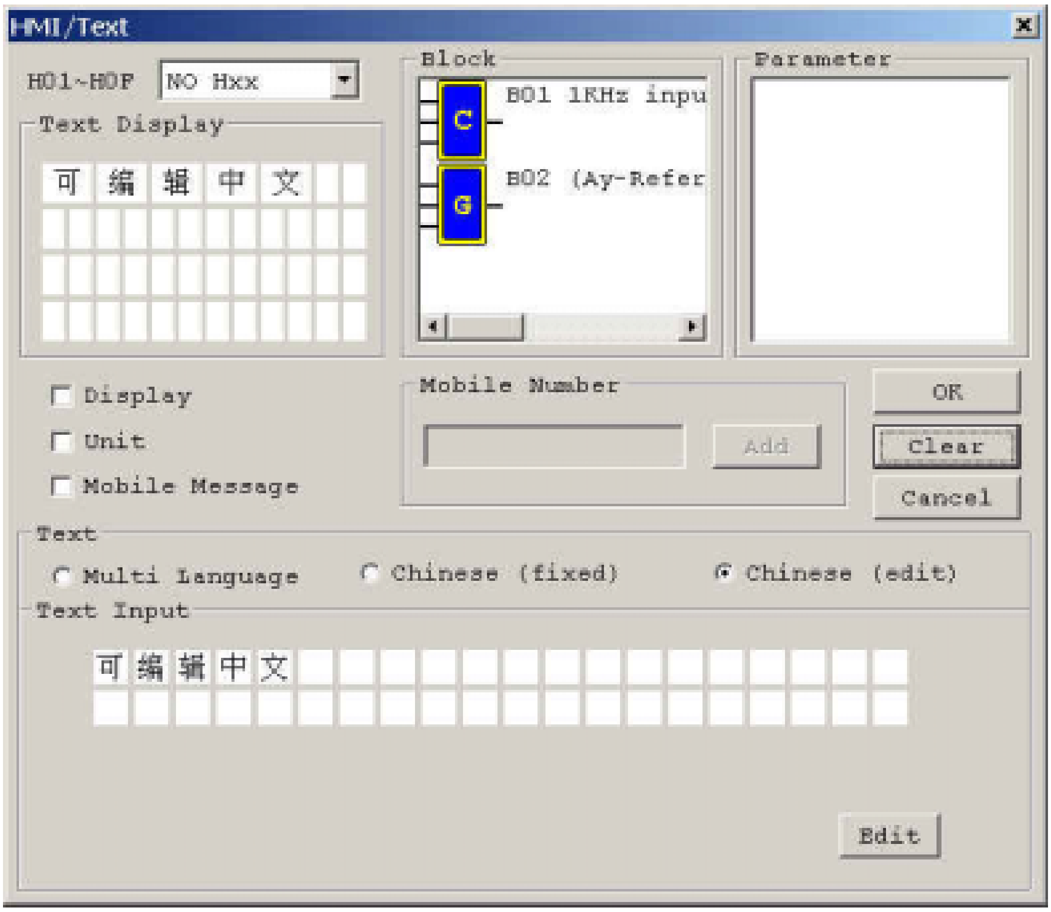
(7) The option of Chinese (fixed) is available in Chinese Operating System. To select 'Chinese (fixed)', Text Input zone displays 40 fixed Chinese characters which can be set to Text Display Zone.

Sample:

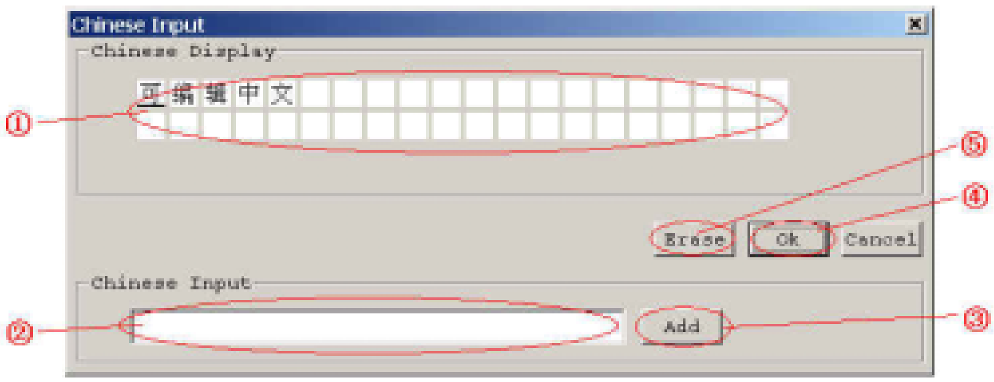


(8) List all the character to input.

(9) The option of Chinese (edit) is available in Chinese Operating System. To select Chinese (edit), The user can add or modify the character required with most characters are 40.



Using method: Select 'Edit' button to display Chinese editing screen



Description:

① Display Chinese to be added.

② Input the Chinese.

③ Press the button 'Add' to add the Chinese to display zone.

④ Select the button 'Ok' to save the edit Chinese data

⑤ Select the button 'Erase' to delete the Chinese the cursor located in the display zone.

(10) Press the button 'Cancel' to exit the edited HMI/Test.

(11) Press the button 'Clear' to delete the Hxx content under editing.

(12) Press the button 'Ok' to the edit HMI/Text.

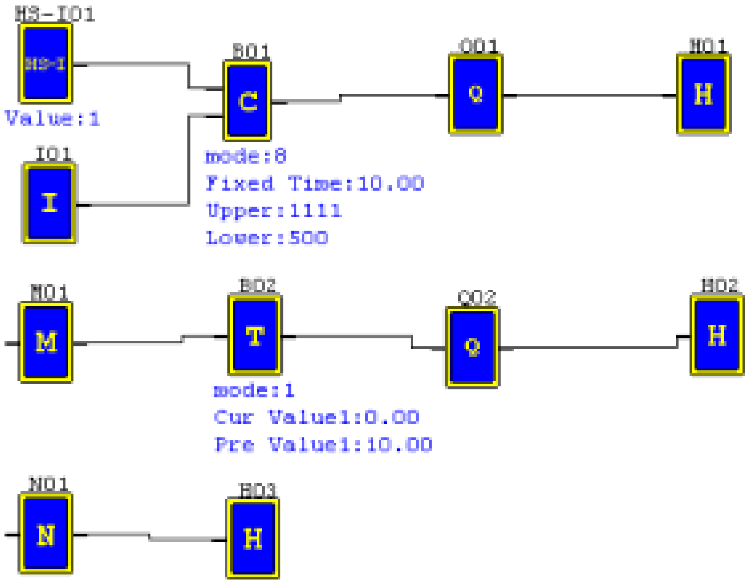
(13) Add the mobile number. It is available only that 'Mobile Message' is selected. First Line can set Phone Number.

(14) Display the parameter of selected components listed in the Function Block Table.

(15) List overall Component Function Block which can be input to preset program.

Integrative Sample for describing HMI display on LCD of master

Example:



H01(LCD display)

```
 C1=10.00Sec
 C1=###
#C1

```

H02(LCD display)

```
 T2=10.00Sec
 T2=##.##Sec
#T2##

```

H03 (LCD display)

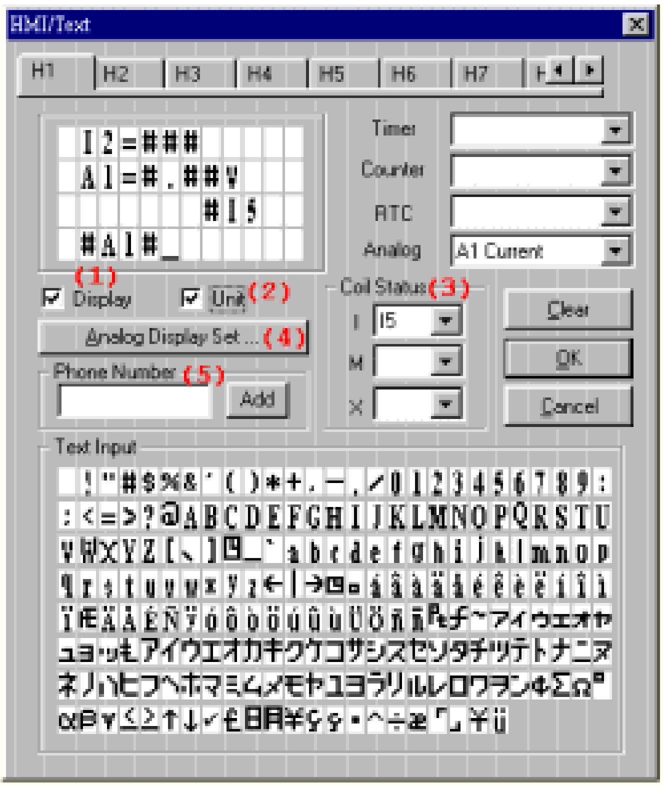
```
 I1=###
#I1
 M1=###
#M1
```

Text Hxx	LCD displays the text when the master	LCD displays the text when the master is

	is under 'Stop' Mode	under 'Run' Mode
H01	C01=10.00 C01=### #C01	T02=10.00Sec T02=##.##Sec #T02#
	Under 'Stop' mode, the current value of text will be marked as '#'.	As the counter is set mode 8, LCD displays the state of the counter. It will display 'ON' when Run, while 'OFF' when STOP.
H02	T02=10.00Sec T02=##.##Sec #T02#	T02=10.00Sec T02=00.00Sec 00.00
	Under 'Stop' mode, the current value of text will be marked as '#'.	The current value of timer is 0.
H03	I01=### I01 M01=### M01	I01=OFF OFF M01=OFF OFF
	Under 'Stop' mode, the current value of text will be marked as '#'.	The state of 'I01' is OFF, and the state of 'M01' is OFF.

◎ Under LADDER Mode

Example:



Note:

(1) When the Display is enabled, the user can press the SEL button for 3 seconds to show the HMI (Text) Messages.

(2) This HMI option is for Timer/Counter/Analog/Coil Status display only. When the option is enabled, it will show A1=#.##V, otherwise, it will display #A1#.

(3) Select Coil Status I, M, X. When the Unit is enabled, it will show I2=###, otherwise, it will display #I2. (### = ON/OFF)

(4) Analog Comparator Display Set: To set Gain (1~999) and Offset(-50~+50) value.

(5) First Line can set Phone Number.

◎ The following example covers to modify the preset value of C1 in HMI under run mode：

To modify the preset value 000010 of the counter mode 7 as present value of T2 in HMI.

Step1：In HMI screen, to press ‘ SEL ’, the cursor blinks in the following location.

T	1	=	0	0	.	0	0	S	e	c
T	1	=	0	0	.	0	5	S	e	c
C	1	＝	0	0	0	0	1	0		
0	0	0	0	0	0					

Step2：Press ‘ DOWN ’ and the cursor skips to C1 preset value position.

T	1	=	0	0	.	0	0	S	e	c
T	1	=	0	0	.	0	5	S	e	c
C	1	＝	0	0	0	0	1	0		
0	0	0	0	0	0					

Step3：Press ‘ SEL ’ for three times, the preset value changes from 000000, A1, T1 in turn.

T	1	=	0	0	.	0	0	S	e	c
T	1	=	0	0	.	0	5	S	e	c
C	1	＝	T	<u>1</u>						
0	0	0	0	0	0					

Step4：Press ‘UP’

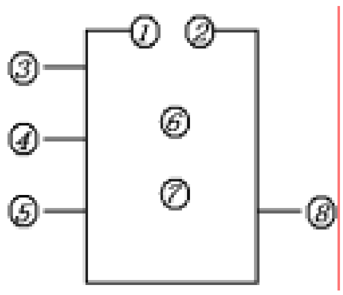
```
T 1 =  0 0 . 0 0 S e c
T 1 =  0 0 . 0 5 S e c
C 1 = T 2
0 0 0  0 0 0
```

Step5：Press ‘OK’ to save the setting.

```
T 1 =  0 0 . 0 0 S e c
T 1 =  0 0 . 0 5 S e c
C 1 = T 2
0 0 0  0 0 0
```

6-3-6 PWM Output Function （only provided for transistor output type.）

The transistor output type has a PWM output terminal ‘Q1’, which can output 8-stage PWM waveform.



Symbol	Description
①	Set display stages (1~8)
②	Display the present stage as operation(0~8)
③	Input Selected Stage 1(I1~gF)
④	Input Selected Stage 2(I1~gF)
⑤	Input Selected Stage 3(I1~gF)
⑥	Set PWM pulse width (0~32768ms)
⑦	Set PWM Period(1~32768ms)
⑧	PWM output terminal P1

Note：

※ For I1~gF, input terminal: I1~IC(I1~I12),
Output terminal: Q1,
Expansion input terminal: X1~XC (X1~X12),
Expansion output terminal: Y1~YF (Y1~Y12)
Counter: C1~CF (C1~C15),
Timer: T1~TF (T1~T15),
RTC Comparator: R1~RF (R1~R15),
Analog Comparator: G1~GF (G1~G15),
Auxiliary terminal: M1~MF（M1~M15）.

The upper case (I1) is Contact ‘a’ while the lower (i1) case is Contact ‘b’.

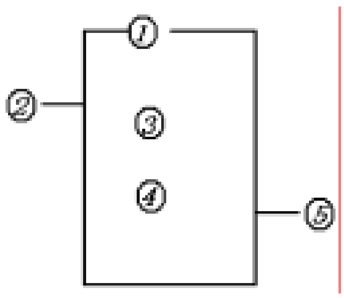
※ The output waveform of output terminal ‘P1-⑧’ is determined by the preset waveform of input terminal 1-③, 2-④, 3-⑤ and PWM Enable.

Enable	⑤	④	③	②	⑧Output PWM
OFF	X	X	X	0	OFF

ON	OFF	OFF	OFF	1	Set stage 1
ON	OFF	OFF	ON	2	Set stage 2
ON	OFF	ON	OFF	3	Set stage 3
ON	OFF	ON	ON	4	Set stage 4
ON	ON	OFF	OFF	5	Set stage 5
ON	ON	OFF	ON	6	Set stage 6
ON	ON	ON	OFF	7	Set stage 7
ON	ON	ON	ON	8	Set stage 8

Note：X indicated ON/OFF input terminal is idle.

6-3-7 I/O LINK Function（only provided for 20Vx-X Type）



Symbol	Description
①	Mode setting (1,2) 1:sending 2:receiving
②	Set the send/receive points(1~8)
③	Set the send/receive points
④	Send/receive memory list location
⑤	I/O link output terminal (L1~L8)

Note:

※ ① Only one sending mode can be set among L1~L8, others are for receiving mode.

※ ② Selecting input points: I1~IC(I1~I12), output points: Q1~Q8, expansive input points: X1~XC(X1~X12), expansive output points: Y1~YF(Y1~Y12), auxiliary points: M1~MF（M1~M15）.

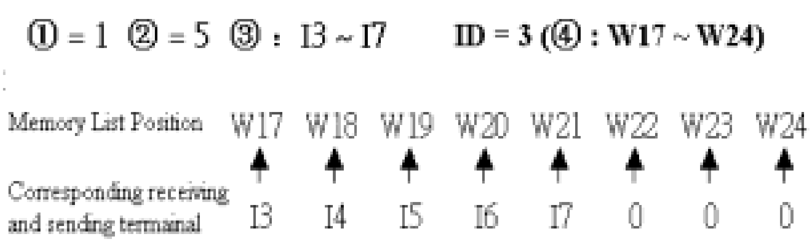
※③ Receiving mode is determined by the controller ID which can not be changed, as the left

list shows. The receiving mode can be selected: W1,W9,W17,W25,W33,W41,W49 and W57.

ID	Memory List Location	Sending memory	Receiving memory
0	W1~W8	W1~W8	W9~W64
1	W9~W16	W9~W16	W1~W8, W17~W64
2	W17~W24	W17~W24	W1~W16, W25~W64
3	W25~W32	W25~W32	W1~W24, W33~W64
4	W33~W40	W33~W40	W1~W32, W41~W64
5	W41~W48	W41~W48	W1~W40, W49~W64
6	W49~W56	W49~W56	W1~W48, W57~W64
7	W57~W64	W57~W64	W1~W56

Sample 1 I/O LINK Mode 1

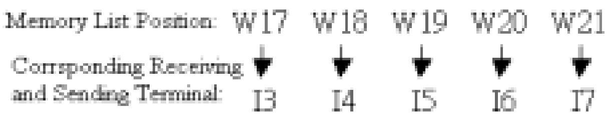
Set ① = 1, ② = 5, set ③ as start from I3, the state of actual sending terminal I3~I7 is sent to memory list; the controller ID = 3, the state of corresponding memory list position W17~W24-④ and relationship of sending terminal is as below:



Sample 2:I/O LINK mode 2

Set ① = 2, ② = 5, set ③ as start from I3, set ④ as start from W17, when enabling the I/O link, the state ‘ON/OFF’ of I3~I7 is controlled by the state of memory list position W17~W21-④, which is irrelative to the actual state of input terminal.

① = 1 ② = 5 ③ : I3 ~ I7 ④ : **W17 ~ W21**



6-4 Operation Method

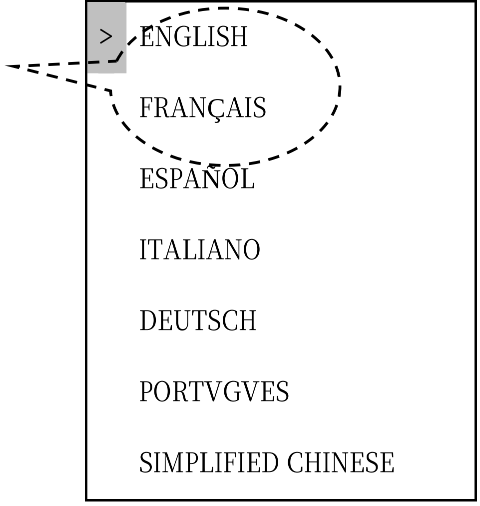
6-4-1 Original Screen

◎ The Original Screen as Power is ON.

(1) Language Setting Screen:

> ENGLISH
FRANÇAIS
ESPAÑOL
ITALIANO

4 Line Display Screen

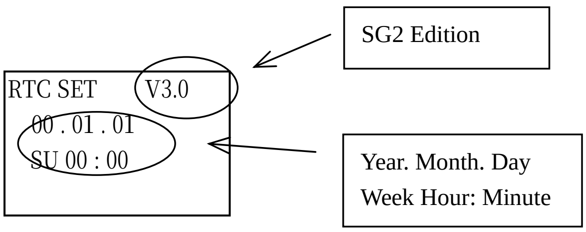


Language Selecting Menu.

Press the buttons：

↑↓	Move the Cursor
OK	Enter the selected language, and display the screen for time setting.

(2) Present Time Setting Screen

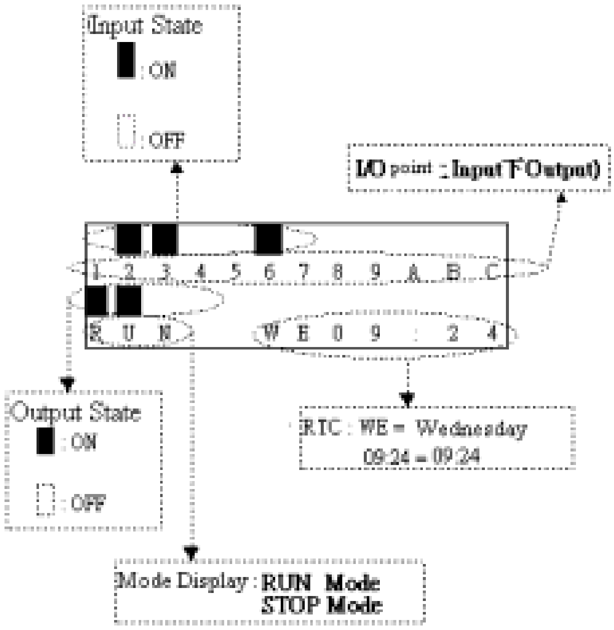


Press the button:

SEL	Begin to input the value
SEL + ←/ →	Move the Cursor
SEL + ↑ / ↓	1. Year = 00~99,Month = 01~12,Day = 01~31 2.Week ⇔TU⇔WE⇔TH⇔FR⇔SA⇔SU⇔MO 3. Hour = 00~23 or Minute = 00~59
OK	Save the RTC Time, Finish the original screen setting, then Display power Start Screen.

Note：The default method is LADDER Edit Mode as the original screen is set.

◎ Original Screen as the power is on.

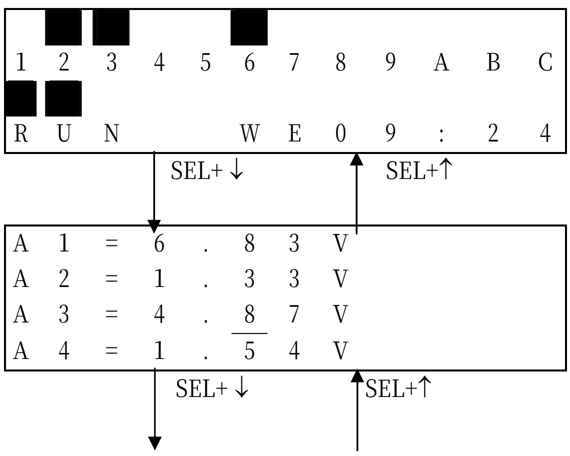


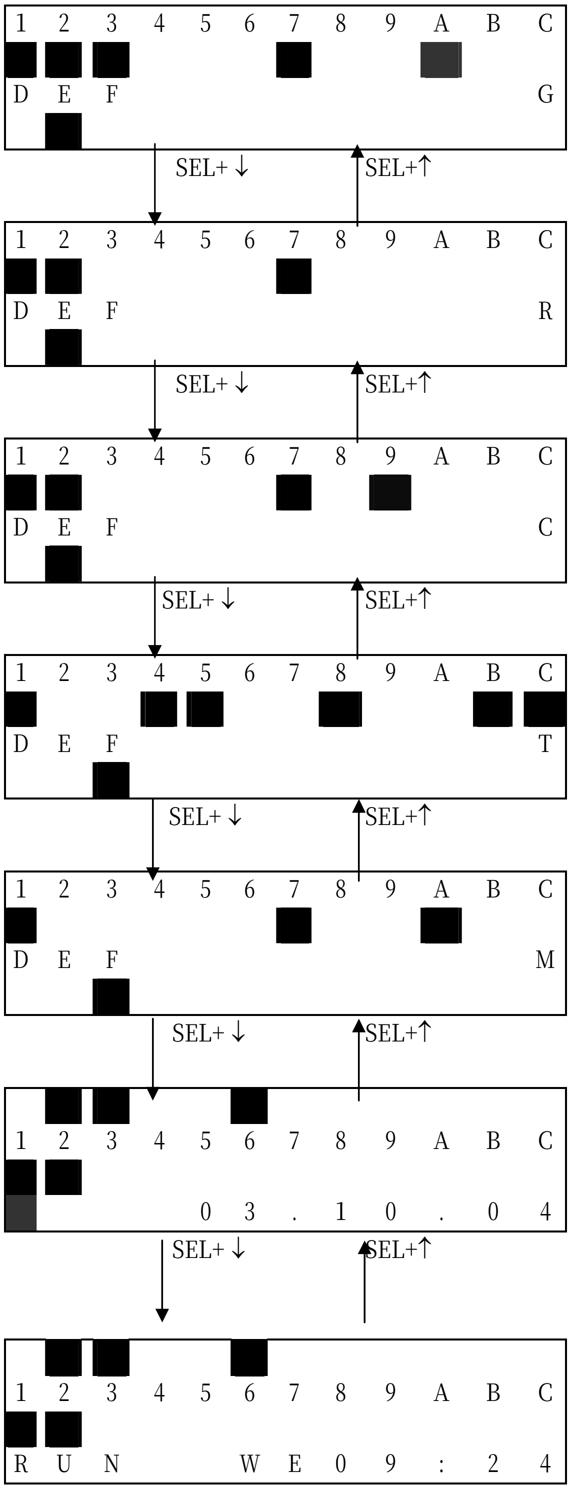
Press the button:

ESC	Back to Main Menu
SEL+↑↓	Under LADDER Edit Mode, display the state of other relays(expansion X&Y⇔M ⇔ T ⇔ C ⇔ R ⇔ G⇔A) ⇔ Original Screen
SEL	H Function will be displayed as the button is pressed for 3 seconds. If Mode 2 is selected for HMI, the H Function will not be displayed.

Sample:

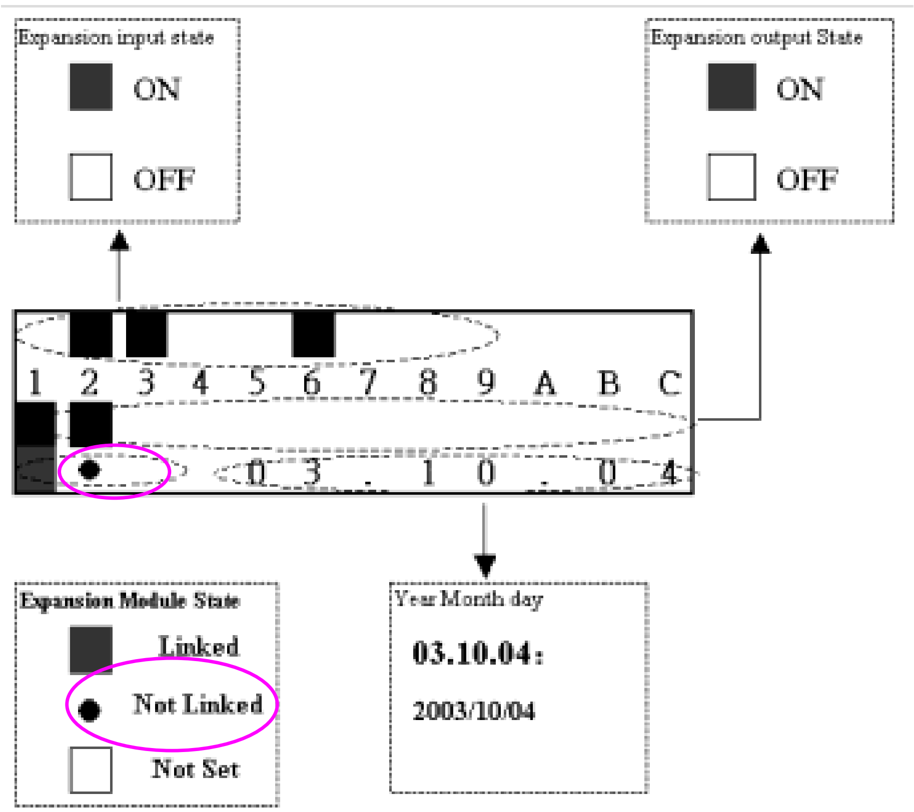
a) Display other relay operation:





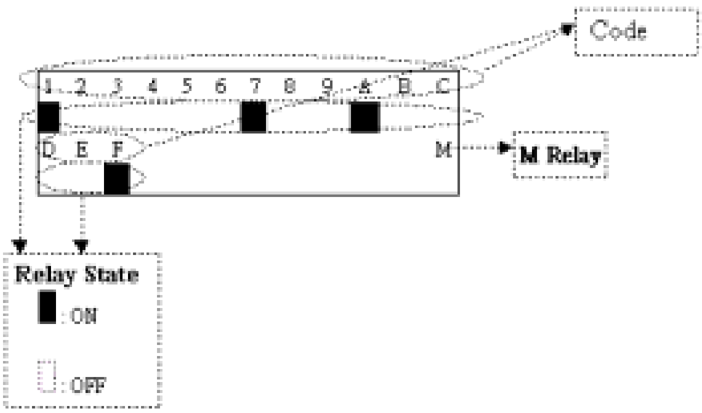
1 2 3 4 5 6 7 8 9 A B C
D E F G
SEL+↓
SEL+↑
1 2 3 4 5 6 7 8 9 A B C
D E F R
SEL+↓
SEL+↑
1 2 3 4 5 6 7 8 9 A B C
D E F C
SEL+↓
SEL+↑
1 2 3 4 5 6 7 8 9 A B C
D E F T
SEL+↓
SEL+↑
1 2 3 4 5 6 7 8 9 A B C
D E F M
SEL+↓
SEL+↑
1 2 3 4 5 6 7 8 9 A B C
0 3 . 1 0 . 0 4
SEL+↓
SEL+↑
1 2 3 4 5 6 7 8 9 A B C
R U N W E 0 9 : 2 4

① Expansion display State

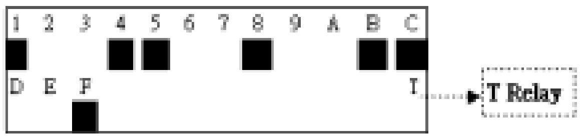


② M Display Status:

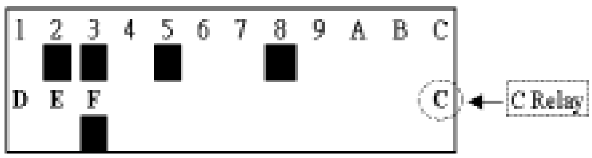
Code of Relay



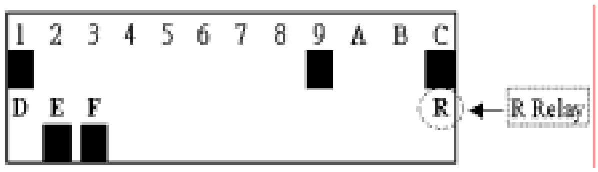
③ T Display State:



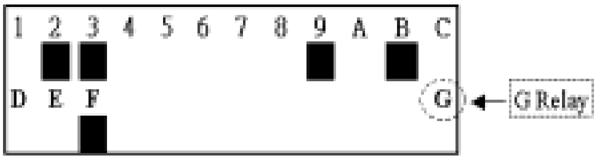
④ C Display State:



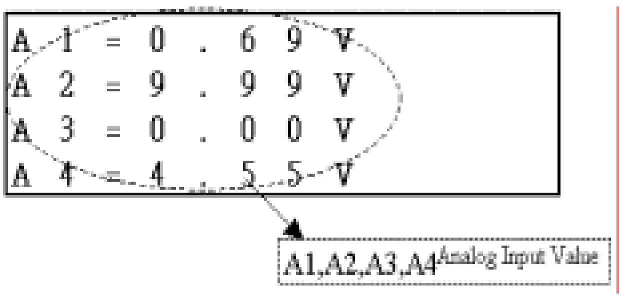
⑤ R Display State:



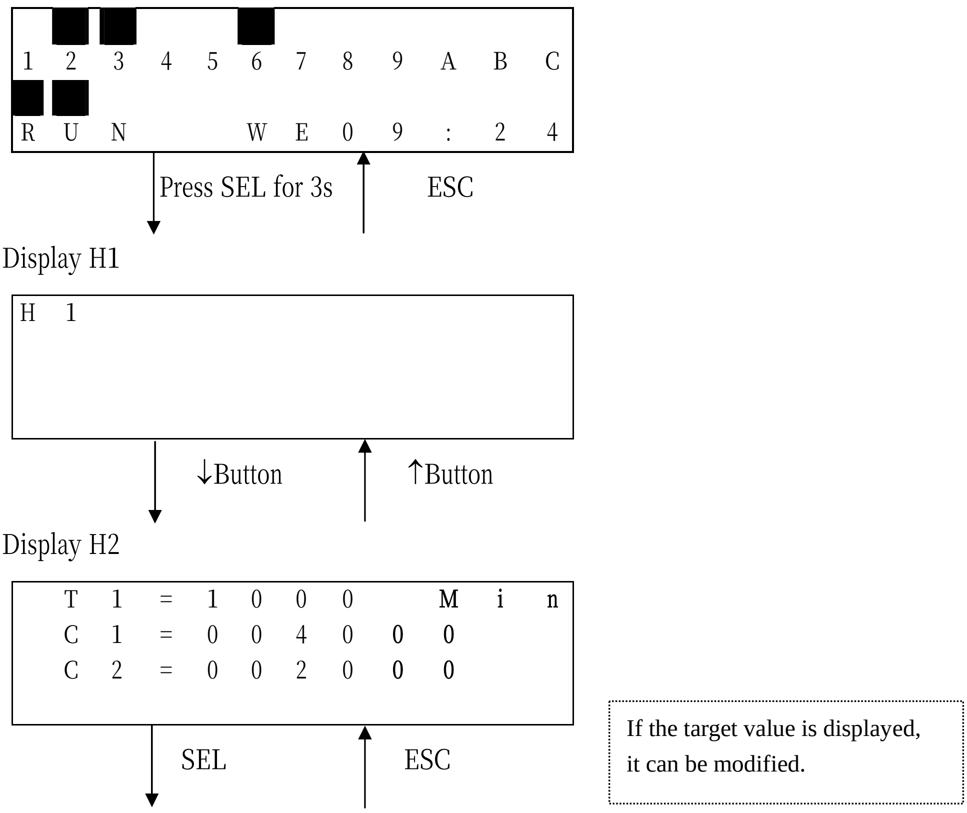
⑥ G Display State:

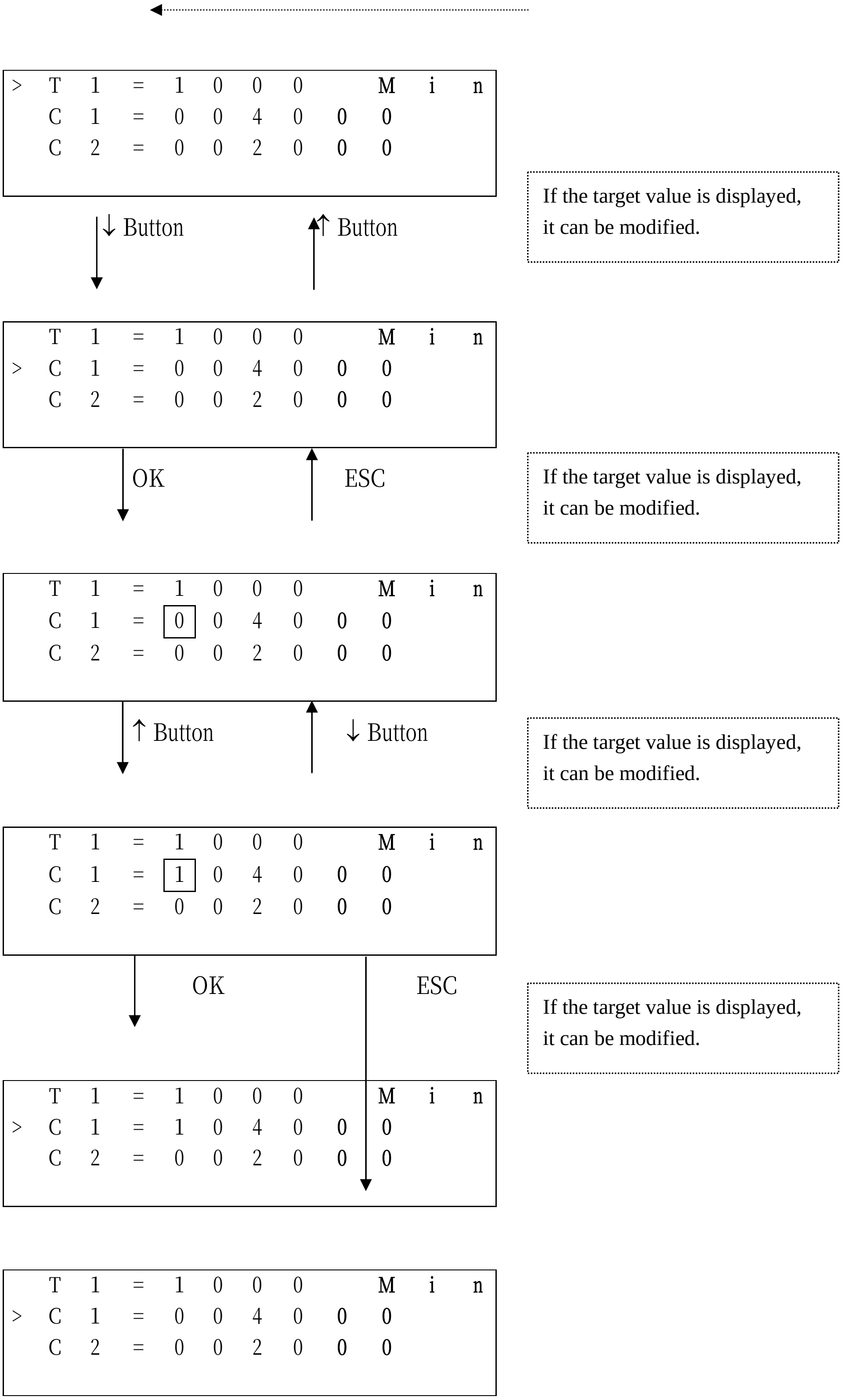


⑦ Analog Input Value:



b) Operation to Display H Function:




> T1=1000 Min
C1=004000
C2=002000
↓ Button
↑ Button
If the target value is displayed, it can be modified.
T1=1000 Min
> C1=004000
C2=002000
OK
ESC
If the target value is displayed, it can be modified.
T1=1000 Min
C1=004000
C2=002000
↑ Button
↓ Button
If the target value is displayed, it can be modified.
T1=1000 Min
C1=104000
C2=002000
OK
ESC
If the target value is displayed, it can be modified.
T1=1000 Min
> C1=104000
C2=002000
T1=1000 Min
> C1=004000
C2=002000

If the target value is displayed, it can be modified.

6-4-2 Main Menu

LCD displays 4-line Main Menu

(1) The Main Menu as SG2 under ‘ STOP ’ Mode.

Menu		Description
> LADDER		
FUN.BLOCK		
RUN		
CLEAR PROG.	→	Clear the user program and the password
WRITE	→	Save user program to PM05
READ	→	Read user Program from PM05
SET		
RTC SET		
ANALOG SET		
PASSWORD		
LANGUAGE	→	Select the language
INITIAL	→	initially set Edit method

(2) The Main Menu as SG2 under ‘ RUN ’ Mode.

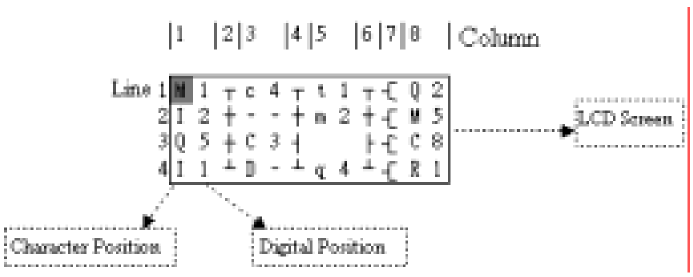
> LADDER
FUN.BLOCK
STOP
WRITE
RTC SET
WRITE
PASSWORD
LANGUAGE

Press the Button

↑ ↓	Move the Cursor to select Main Menu
OK	Confirm the selected Function
ESC	Skip to Initial Screen

※SG2 can be modified, edited, cleared and read user program only when it is under STOP Mode.
※As the program is modified, SG2 will automatically backup it to EEPROM. (not PM05)

◎ Main Menu LADDER



Press the Button

Button	Description
SEL	1. Ix ⇒ ix ⇒ — ⇒ space ⇒ Ix (only for digital and character position of 1,3,5 column.)

	2. Qx ⇒ space ⇒ Qx (only for digital and character position of 8 column.). 3. ┬ ⇒ space ⇒ ┬ (all available but the 2,4,6 column of the first line) ⊥ ⊥ x : Digital: 1~F
SEL +↑/ ↓	1. 1...F, – (When the cursor locates the digital position, the range of digital is restricted by the relay type. 2. I ⇔ X ⇔ Q ⇔ Y⇔ M ⇔ D ⇔ T ⇔ C ⇔ R ⇔ G ⇔ I (When the cursor located at 1,3,5 Column). 3. Q ⇔ Y ⇔ M ⇔ T ⇔ C ⇔ R ⇔ G ⇔H ⇔ L ⇔P ⇔ Q (When the cursor located at 8 Column) 4. (⇔ ⩓ ⇔ ⩔ ⇔ P ⇔ ((When the cursor located at 7 Column, and the 8 Column is set as Q,Y,M) 5. (⇔ P ⇔ (((When the cursor located at 7 Column, and the 8 Column is set as T)
SEL + ←/→	Confirm the input data and move the cursor
↑/ ↓	Vertically move the cursor
←/ →	Horizontally move the cursor
DEL	Delete an instruction
ESC	1. Cancel the Instruction or action under Edition. 2. Back to Main Menu after query the program.
OK	1. Confirm the data and automatically save, the cursor moves to next input position. 2. When the cursor is on Column 8, Press the button to automatically enter the function block and set the parameters(such as T/C)。
SEL+DEL	Delete a Line of Instruction.
SEL+ESC	Display the number of the Lines and operation state of SG2 (RUN/STOP)。
SEL+↑/ ↓	Skip up/ down every 4-line program.
SEL+OK	Insert a space line

Operation Sample：

		1	2	3	4	5	6	7	8	Column
	Line 1	> L A D D E R								
	2	F U N . B L O C K								
	3	R U N								
	4	C L E A R P R O G .								

		1	2	3	4	5	6	7	8	Column
Procedure 1: Press ‘ OK ’ Enter LADDER Edition	Line 1									
	2									
	3									
	4									

Procedure	Display
Procedure 2 : Press ‘ SEL ’ (When cursor located at character or digital, press the button to show I1)	Column: 1 2 3 4 5 6 7 8 Line 1: $\underline{\text{I}}$ 1 2 3 4

Procedure	Display
Procedure 3 : Press ‘ ↑ ’ twice. (Press ‘ SEL ’ + ‘ ↑↓ ’, and the digital cursor located will change from I to Q).	Column: 1 2 3 4 5 6 7 8 Line 1: $\underline{\text{Q}}$ 1 2 3 4

Procedure	Display
Procedure 4 : Press ‘ SEL ’ (start /end modifying parameter)	Column: 1 2 3 4 5 6 7 8 Line 1: $\underline{\text{q}}$ 1 2 3 4

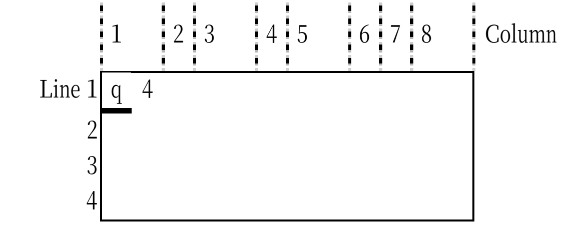
Procedure	Display
Procedure 5 : Press ‘ → ’ (“ Press ‘ SEL ’ + ‘ ←→ ’, the cursor located in digital)	Column: 1 2 3 4 5 6 7 8 Line 1: q $\underline{1}$ 2 3 4

Procedure	Display
Procedure 6 : Press ‘ ↑ ’ for 3 times (“ Press ‘ SEL ’ + ‘ ↑↓ ’ the digital the cursor located will change from 1 to 4)	Column: 1 2 3 4 5 6 7 8 Line 1: q $\underline{4}$ 2 3 4

Procedure 7 :

Press ‘ ← ’

(Press ‘ SEL ’ + ‘ ←→ ’
to move the cursor to the position
Required revision.

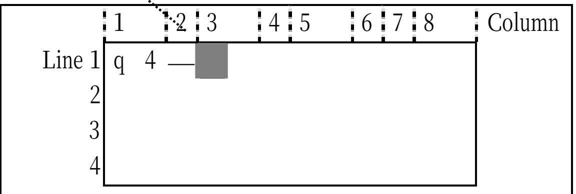


Automatically Link

OR

Procedure 7 :
Press ‘ OK ’

(Move the cursor to character in column 3)

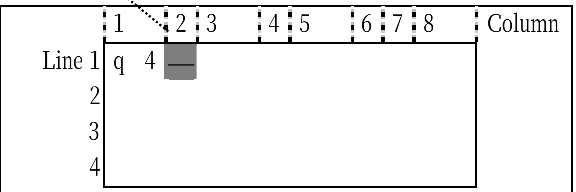


Automatically Link

OR

Procedure 7 :
Press ‘ → ’

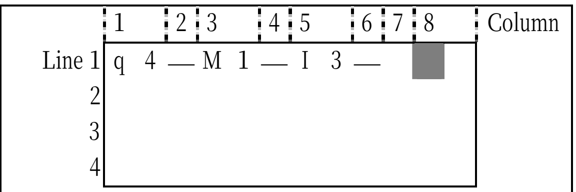
(move the cursor to the link location in column 2)



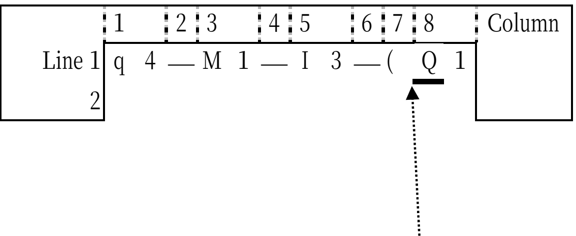
Repeat the step1~7, and input M1, I3 Instruction to column 3, 5.

Procedure 8 :
Press ‘ OK ’ in Column 5

(move the cursor to the character in column 8)



Procedure 9 :
Press ‘ SEL ’



(when the cursor located at character and digital, press ' SEL ' to show ' – (Q1 ')	3 4

Auto Add " -("

Procedure 10 : Press ' OK ' Save the input program data, the position of the cursor will not move.	1 2 3 4 5 6 7 8 Column Line 1 q 4 — M 1 — I 3 —(Q 1 2 3 4

Procedure 11 : Press ' → ' twice (move the cursor to column 1 and Line 2.)	1 2 3 4 5 6 7 8 Column Line 1 q 4 — M 1 — I 3 —(Q 1 2 3 4

Procedure 12 : Press ' → ' twice (move the cursor to column 2) Note: never press ' SEL ' before hand	1 2 3 4 5 6 7 8 Column Line 1 q 4 — M 1 — I 3 —(Q 1 2 3 4

Change Wire '—' to '┬ ┴'

Procedure 13 : Press ' SEL ' (A vertical line emerges)	1 2 3 4 5 6 7 8 Column Line 1 q 4 ┬ M 1 — I 3 — (Q 1 2 ┴ 3 4

Procedure 14 : Press ' OK '	1 2 3 4 5 6 7 8 Column Line 1 q 4 ┬ M 1 — I 3 —(Q 1

(Move the cursor to character in column 3.)	2 ⊥ 3 4

Repeat the step 1~7 and key in ‘ r 3 ’ , — ” at Line 2 and column 3~6.

Procedure 15 : Press ‘ OK ’ in column 5 (move the cursor to the character in Column 8)	Column: 1 2 3 4 5 6 7 8 Line 1 q 4 ┬ M 1 — I 3 — (Q 1 2 ⊥ r 3 ————— (█ 3 4

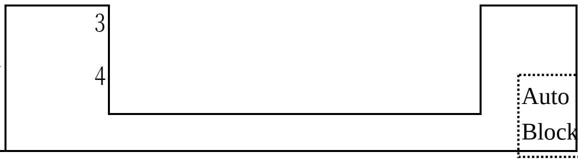
Procedure 16 : Press ‘ SEL ’ (When the cursor located in digital or character, press ‘ SEL ’ , ‘ Q1 ’ will emerges)	Column: 1 2 3 4 5 6 7 8 Line 1 q 4 ┬ M 1 — I 3 — (Q 1 2 ⊥ r 3 ————— (Q 1 3 4

Auto Add “ ” ⊏

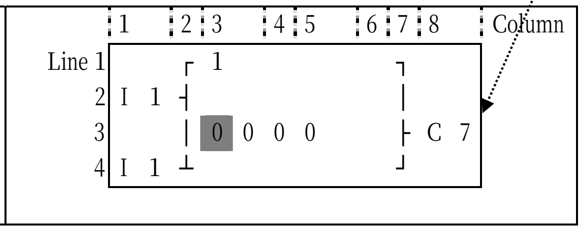
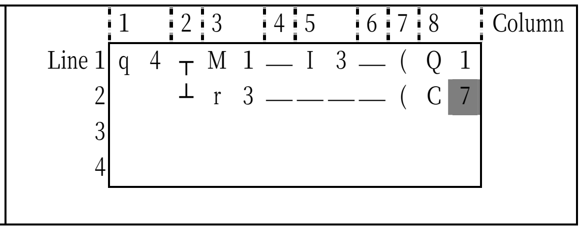
Procedure 17 : Press ‘ ↑ ’ for 4 times (Press ‘ SEL ’ + ‘ ↑↓ ’ (The character Q the cursor locating will change to C.)	Column: 1 2 3 4 5 6 7 8 Line 1 q 4 ┬ M 1 — I 3 — (Q 1 2 ⊥ r 3 ————— (C 1 3 4

Procedure 18 : Press ‘ → ’	Column: 1 2 3 4 5 6 7 8 Line 1 q 4 ┬ M 1 — I 3 — (Q 1 2 ⊥ r 3 ————— (C 1 3 4

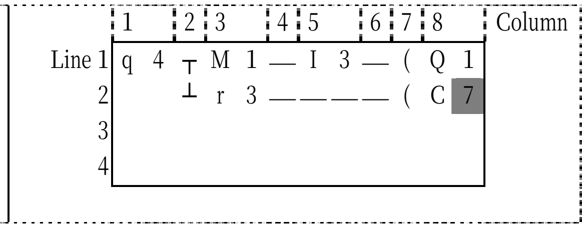
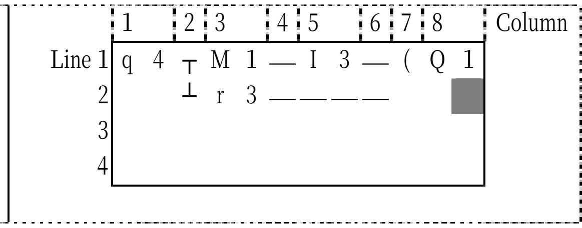
Procedure 19 : Press ‘ ↑ ’ for 7 times	Column: 1 2 3 4 5 6 7 8 Line 1 q 4 ┬ M 1 — I 3 — (Q 1 2 ⊥ r 3 ————— (C 7

(Press ‘ SEL ’ + ‘ ↑↓ ’ The digital 1 the cursor locating will change to 7)	

Auto Enter Function Block Edition

Procedure 20 : Press ‘ OK ’ (Auto shift to FUNCTION BLOCK and the counter input parameter)	
Procedure 21 : Press ‘ ESC ’ back to LADDER edition screen	

Delete the Program Element

	
Procedure : Press ‘ DEL ’ (to delete the element C7 the cursor locating)	

Display the present Line the cursor locating and operation state of SG2.

Procedure :		1 2 3 4 5 6 7 8 Column
Press ‘SEL+ESC’ (simultaneously)	Line 1	q 4 ┬ M 1 — I 3 — (Q 1
	2	┴ r 3 ———— (C 7
(The Line 4 displays where the cursor	3	
locating and operation state of SG2)	4	S T O P L I N E 0 0 2

Delete the whole Line

		1 2 3 4 5 6 7 8 Column
	Line 1	q 4 ┬ M 1 — I 3 — (Q 1
	2	┴ r 3 ———— (C 7
	3	
	4	

Procedure :		1 2 3 4 5 6 7 8 Column
Press ‘SEL+DEL’ (Simultaneously)	Line 1	q 4 ┬ M 1 — I 3 — (Q 1
	2	┴ r 3 ———— (C 7
	3	C L E A R L n 0 0 2
(‘ESC’ Cancel , ‘OK’ Execute)	4	E S C ? O K ?

Insert a whole line.

		1 2 3 4 5 6 7 8 column
	line 1	q 4 ┬ M 1 — I 3 — (Q 1
	2	┴ r 3 ———— (C 7
	3	
	4	

Step:		1 2 3 4 5 6 7 8 column
Press “SEL+OK” (at the same time)	Line 1	q 4 ┬ M 1 — I 3 — (Q 1
	2	
	3	┴ r 3 ———— (C 7
	4	

Turn page (move upward/ downward 4 lines program)：

		1	2	3	4	5	6	7	8	column
	line 1	q	4	┬ M	1 —	I	3 —	(	Q	1
	2			┴ r	3 ——	——	——	(	C	7
	3									
	4									
	5									

		1	2	3	4	5	6	7	8	column
step： Press ‘ SEL+↑ ↓ ’ （at the same time）	line 1	q	4	┬ M	1 —	I	3 —	(	Q	1
	2			┴ r	3 ——	——	——	(	C	7
	3									
	4									
	5									

◎ FUNCTION BLOCK program input

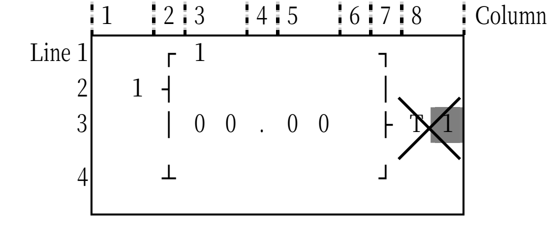
		1	2	3	4	5	6	7	8	Column
	Line 1		L A	D D	E R					
	2	>	F U	N .	B L	O C	K			
	3		R U	N						
	4		C L	E A	R	P R	O G	.		

The present value will appear when SG2 is under ‘ RUN’ mode.

		1	2	3	4	5	6	7	8	Column
Procedure 1: Press ‘ OK ’ (Enter FUNCTION BLOCK edition)	Line 1		┌	1			┐			
	2		1 ┤				│			
	3		│	0 0	.	0 0	├		T	1
	4		┴				┘			

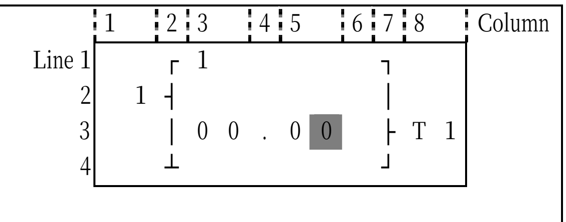
Preset action area

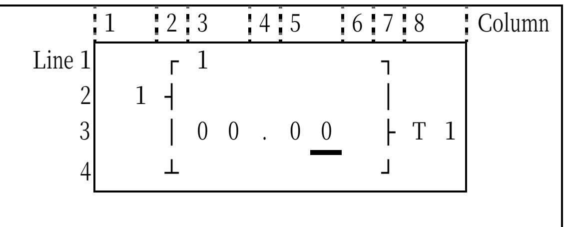
Preset action value area

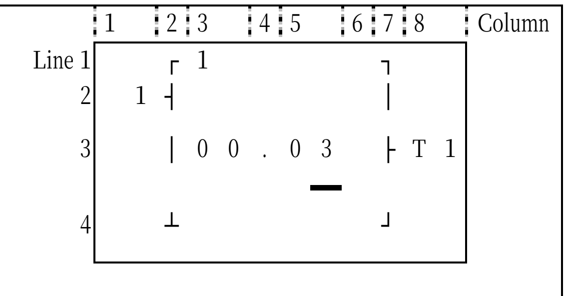
Never press ‘ → ’ to move to the digital position. (If T2 is required to be changed, Press ‘ ↑ ’ / ‘ ↓ ’ and ‘ SEL ’ to execute.)	

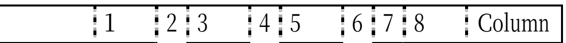
Step 2: modify ① preset target value ②preset the action relay

① Preset the target value

① Procedure 2-1: Press ‘ ← ’ (move the cursor to the preset action area)	

① Procedure 2-2: Press ‘ SEL ’ (begin input the target value)	

① Procedure 2-3: Press ‘ ↑ ’ for 3 times (Press ‘ SEL ’ and followed by ‘ ↑,↓ ’ The digital ‘ 0 ’ is changed to ‘ 3 ’)	

① Procedure 2-4:	

Press ' OK ' (Save the input data)	Line 1 ┌ 1 ┐ 2 1 ┤ | 3 | 0 0 . 0 3 ├ T 1 4 ┴ ┘

① Procedure 2-5: Press ' ← '	1 2 3 4 5 6 7 8 Column Line 1 ┌ 1 ┐ 2 1 ┤ | 3 | 0 0 . 0 3 ├ T 1 4 ┴ ┘

Repeat Step 2-2 ~ step 2-4 for 3 times, to enter the following screen:

① Procedure 2-6:	1 2 3 4 5 6 7 8 Column Line 1 ┌ 1 ┐ 2 1 ┤ | 3 | 3 3 . 3 3 ├ T 1 4 ┴ ┘

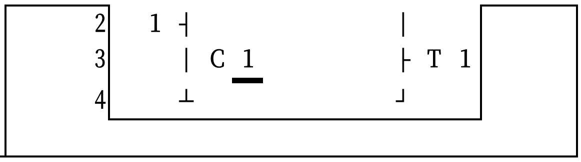
As the preset value of the timer, counter and analog comparator is set as the preset value of them. Next to the step 2-2, to execute the following operation:

①Step2-3A: Press ' SEL '	1 2 3 4 5 6 7 8 column line 1 ┌ 1 ┐ 2 1 ┤ | 3 | A 1 ├ T 1 4 ┴ ┘

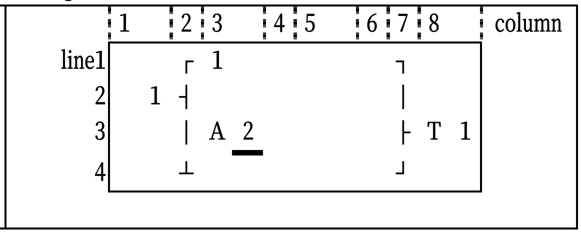
Repeat the step 2—3A, the following screen will be shown in turn:

①step 2-3B: press ' SEL '	1 2 3 4 5 6 7 8 column line 1 ┌ 1 ┐ 2 1 ┤ | 3 | T 1 ├ T 1 4 ┴ ┘

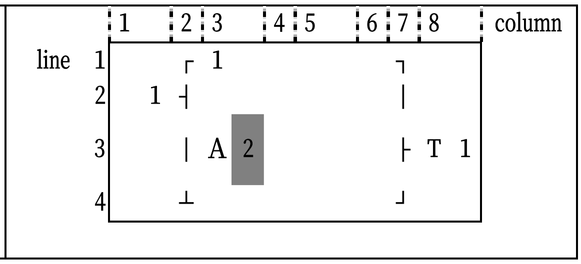
①step 2-3C: Press ' SEL '	1 2 3 4 5 6 7 8 column line 1 ┌ 1 ┐

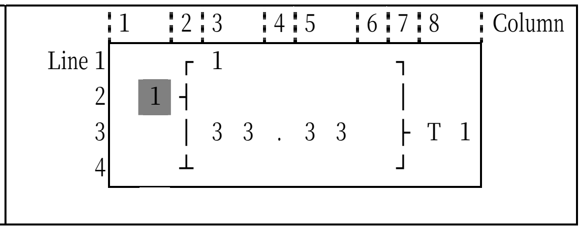
	

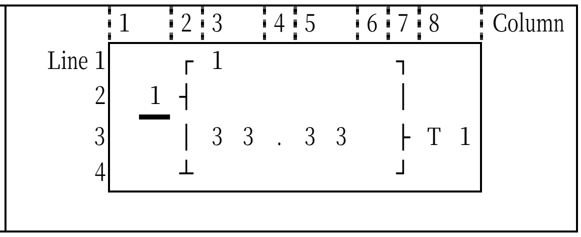
Next to step 2—3A, then '↑', the following screen will be shown.

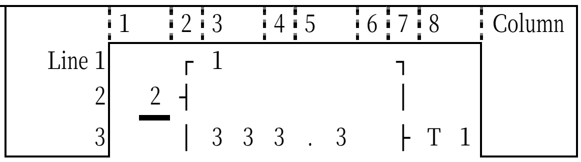
①step 24A: Press '↑'	

Repeat step2—4A (press '↓' is also available), the preset value of A1~A8 will be periodically changed. And so on. The other function blocks (time, counter) present value is set as preset value, to repeat the step to select T1~TF, C1~CF.

①step 2-5A: press 'OK' Save the present data.	

① Procedure 2-7: Press '↑'	

② Procedure 2-8: Press 'SEL' (begin to edit data)	

② Procedure 2-9: Press '↑' (Press 'SEL' + '↑,↓'	

to change1 ’ to ‘ 2 ’)	4 ┴ ┘
② Procedure 2-10: Press ‘ OK ’ (save the input data)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 1 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 ┴ ┘
② Procedure 2-11: Press ‘ ↑ ’ (move the cursor to ‘ 1 ” position)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 1 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

② Procedure 2-12: Press ‘ SEL ’ (begin to edit data)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 1 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 ┴ ┘

② c 2-13: Press ‘ ↑ ’ for 3 times (Press ‘ SEL ’ and followed by ‘ ↑↓ ’ to change 1 to 5)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 I 1 ┴ ┘

② Procedure 2-14: Press ‘ OK ’	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │

(save input data)	3 │ 3 3 3 . 3 ├ T 1 4 I 1 ┴ ┘

② Procedure 2-15: Press '↓' for 3 times (this step leads to editing the action relay)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 I 1 ┴ ┘

② Edit action program and preset the action relay

② Procedure 2-16: Press 'SEL' (Begin to modify)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 I 1 ┴ ┘

② Procedure 2-17: Press '↑' for 4 times (Press 'SEL' + '↑↓' to change I to M)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 1 ┴ ┘

② Procedure 2-18: Press '→' (Press 'SEL' + '← →' to move the cursor to digital location)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 1 ┴ ┘

② Procedure 2-19: Press '↑' for 3 times	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │

(Press ‘SEL’ + ‘↑↓’ to change ‘1’ to ‘4’)	3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

② Procedure 2-20: Press ‘OK’ (save the input data)	1 ┊2┊3 ┊4┊5 ┊6┊7┊8 ┊ Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

① Procedure 2-21: Press ‘↑’ (Move the cursor to preset action value area to repeat the step 2-1)	1 ┊2┊3 ┊4┊5 ┊6┊7┊8 ┊ Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

② Procedure 2-22: Press ‘↑’ (Move the cursor to position ‘2’ to repeat the 2-8)	1 ┊2┊3 ┊4┊5 ┊6┊7┊8 ┊ Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

The detail operation of modify the analog comparator Ax, Ay:

② step 2-22A: Press ‘↑’ (Move the cursor to 2, or repeat the next step. Select A1~A8	1 ┊2┊3 ┊4┊5 ┊6┊7┊8 ┊ column line 1 ┌ 4 ┐ 2 A 1 ┤ │ 3 A 3 │ ├ G 1 4 ┴ 0 3 . 3 3 ┘

② Step 2-22B: Press ‘SEL’ (Move the cursor to 2 to repeat the above step. Select A2-T1-C1-A1)	1 ┊2┊3 ┊4┊5 ┊6┊7┊8 ┊ column line 1 ┌ 4 ┐ 2 A 1 ┤ │ 3 T 1 │ ├ G 1 4 ┴ 0 3 . 3 3 ┘

② Step 2-22C: Press ‘↑’ (Move the cursor to 2 to repeat the above step. Select T1~TF,C1~CF,A1~A8)	1 2 3 4 5 6 7 8 column line 1 ┌ 4 ┐ 2 A 1 ┤ │ 3 T 2 │ ├ G 1 4 ┴ 0 3 . 3 3 ┘

② Step 2-22D: Press ‘OK’ Save the present data	1 2 3 4 5 6 7 8 column line 1 ┌ 4 ┐ 2 A 4 ┤ │ 3 T F │ 0 3 . 3 3 ├ G 1 4 ┴ ┘

② Procedure 2-23: Press ‘↑’ (Move the cursor to position ‘4’ to repeat the step 2-12)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

Continue to input Function Block

① Next Function Block

	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

Procedure 1: Press ‘SEL+↑’ (Simultaneously)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 2 ┐ 2 1 ┤ │ 3 │ 0 1 0 . 0 ├ T 2 4 I 2 ┴ ┘

② Last Function Block

	1 2 3 4 5 6 7 8 Column Line 1 ┌ 4 ┐ 2 2 ┤ │ 3 │ 3 3 3 . 3 ├ T 1 4 M 4 ┴ ┘

Procedure : Press ‘ SEL+↓ ’ (Simultaneously)	1 2 3 4 5 6 7 8 Column v 1 ┌ 3 ┐ 2 2 ┤ │ 3 │ 0 5 0 . 0 ├ T F 4 R 1 ┴ ┘

Delete Function Block

Procedure ： Press ‘ SEL+DEL ’ (Simultaneously) (‘ ESC ’ : Cancel ; ‘ OK ’ : Execute)	1 2 3 4 5 6 7 8 Column Line 1 ┌ 5 ┐ 2 2 ┤ │ 3 C L E A R B L O C K 4 E S C ? O K ?

Back to Main Menu:

Press ‘ ESC ’	1 2 3 4 5 6 7 8 Column Line 1 L A D D E R 2 > F U N . B L O C K 3 R U N 4 C L E A R P R O G .

Change Function Block Category:

	1 2 3 4 5 6 7 8 Column Line 1 ┌ 3 ┐ 2 3 ┤ │

	3	0 0 0 0 ├ T 2 4 M 4 ┴ ┘

Move the cursor to change to T , C , R , G, H

Step 1: Press ‘ SEL ’	1 2 3 4 5 6 7 8 Column Line 1 ┌ 2 ┐ 2 M 1 ┤ | 3	9 9 9 9 9 9 ├ C 1 4 M 2 ┴ ┘

◎ RUN or STOP

(1) RUN Mode

RUN PROG.

>YES
NO

(2) STOP Mode

STOP PROG.

>YES
NO

↑ ↓	Move the cursor
OK	Execute the instruction, then back to main menu
ESC	Back to main menu

◎Other Menu Items

(1) CLEAR PROGRAM (Clear RAM, EEPROM and Password at the same time)

CLEAR PROG.

YES
>NO

(2) WRITE (save the program (RAM) to the PM05 program spare cartridge)

WRITE

YES
>NO

(3) READ (read the program from the PM05 program spare cartridge to SG2 (RAM))

```
READ

 YES
>NO
```

When C type or K type machine power up, the program in PM05 will be auto downloaded to the machine and be executed. But there are same exceptional cases:

1. program about 20 point in PM05 can't be downloaded to 10 point machine;
2. program about DC type in PM05 can't be downloaded to AC type machine;
3. program about Transistor type in PM05 can't be downloaded to Relay type machine;

(1) ~ (3) Now Press:

↑ ↓	Move the cursor
OK	Execute the instruction, then back to main menu
ESC	Back to main menu

(4) SET (system setting)

ID SET 01	→	ID setting (00~99)
REMOTE I / 0 N	→	Remote I/O Mode (N: none M: Master S:S lave)
BACK LIGHT ☓	→	Back light mode (√: always light ☓: light for 5s after pressed.)
M KEEP √	→	M: non-Volatile (√:Volatile ☓: Non- Volatile)
I/O NUMBER 0	→	Expansion I/O Points (0~3)
I/O ALARM √	→	Siren setting when is not available to Expansion I/O Points (√:Yes ☓:No)
C KEEP ☓	→	in stop/run switching, Counter Present Value Keeping (√:Yes ☓:No)

Note:

M KEEP function is only available for keeping M status in RUN mode when power is resupplied after loss.

Now Press:

↑↓←→	Move the cursor
SEL	Begin to edit.
Press 'SEL' and '← →'	Move the cursor for 'ID SET item'

Press ‘ SEL ’ and ‘ ↑↓ ’	1. ID SET=00~99 ; I/O NUMBER=0~3 2. REMOTE I/O= N⇔M⇔S⇔N 3. BACK LIGHT ; C KEEP =x⇔√ 4. M KEEP; I/O ALARM =√⇔x
OK	Confirm the Edition Data
ESC	1. Cancel the setting when pressed ‘ SEL ’ 2. Back to Main Menu

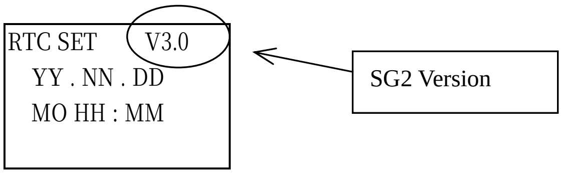
Note：

① When I/O LINK is selected, ID setting range is 0~7 , which should be continuous。ID=0default as Master, ID=1~7 default as Slave

② When REMOTE I/O is selected, the distribution of the remote I/O is as follows:

Master			Slave
Remote Input	X1~X12	←	I1~I12
Remote Output	Y1~Y8	→	Q1~Q8

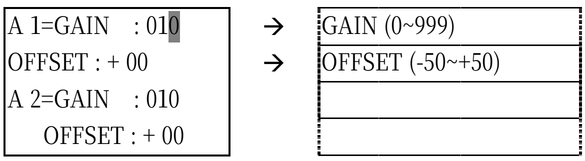
(5) RTC Setting



Now Press

SEL	Begin to input parameters
Press ‘ SEL ’ + ‘ ←→ ’	Move the Cursor
SEL then ↑ ↓	1. YY=00~99,NN=01~12,DD=01~31 2.MO⇔TU⇔WE⇔TH⇔FR⇔SA⇔SU⇔MO 3. HH = 00~23 or MM = 00~59
OK	Save the Input Data
ESC	1. Cancel the Input Data when press ‘ SEL ’ . 2. Back to Main Menu.

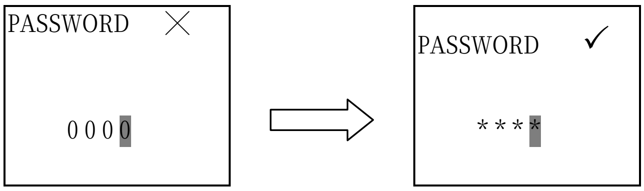
(6) ANALOG SETTING



Now Press

↑↓	1. Move downward the Cursor 2. Switch the setting screen from A1, A2 to A3, A4.
SEL	Begin to input parameters
Press ‘ SEL ’ + ‘ ←→ ’	Move the Cursor
‘ SEL ’ + ‘ ↑↓ ’	1. GAIN =000~999 2. OFFSET=-50~+50
OK	Save the Input Data
ESC	1. Cancel the Input Data when press ‘ SEL ’ . 2. Back to Main Menu.

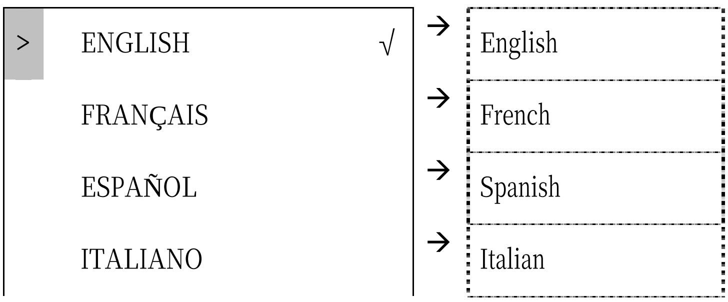
(7) SETTING PASSWORD



Now Press

SEL	1. Begin to input numeral 2. When the password is ON, it will not display 0000, but ****.
Press ‘ SEL ’ + ‘ ←→ ’	Move the cursor
Press ‘ SEL ’ + ‘ ↑↓ ’	0~9
OK	Save the input data, not 0000, as the PASSWORD is ON.
ESC	1. Cancel the Input Data when press ‘ SEL ’ . 2. Back to Main Menu.

(8) LANGUAGE Selection



DEUTSCH	→	German
PORTVGVES	→	Portuguese
SIMPLIFIED CHINESE	→	Simplified Chinese

Now Press

Press '↑↓'	Vertically move the Cursor
OK	Select the language the cursor located
ESC	Back to Main Menu

Sample:

> ENGLISH √
FRANÇAIS
ESPAÑOL
ITALIANO

↓key ↑key

ENGLISH √
> FRANÇAIS
ESPAÑOL
ITALIANO

OK

ENGLISH
> FRANÇAIS √

ESPAÑOL

ITALIANO

(8) INITIAL

INITIAL

> LADDER √

FBD

Now Press:

Press '↑↓'	Vertically move the Cursor
OK	Select the language the cursor located
ESC	Back to Main Menu

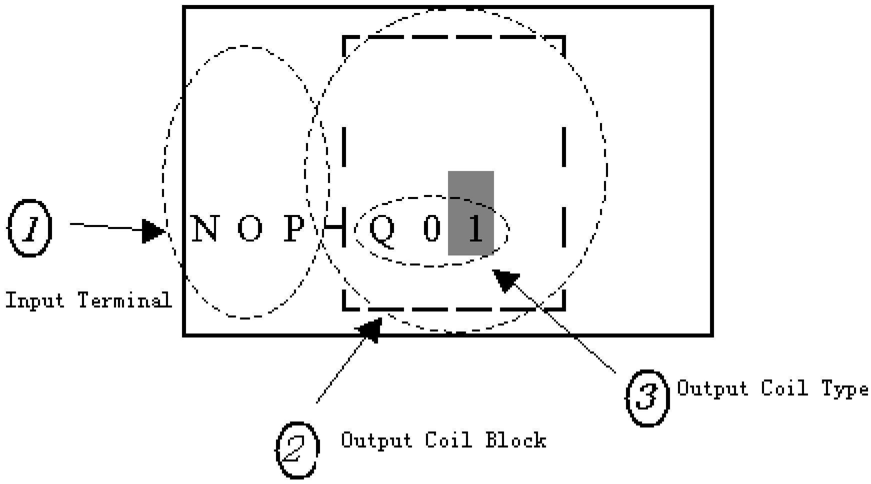
⚠ The origin program will be cleared as the change of edition method.

Content

Chapter 7 FBD Block Description

Note: FBD program can only be edited and modified in SG2 Client software and write to SG2 controlled equipments via communication cable. Via controlled equipment, FBD program is available for querying or the parameter of the function block of the program for modifying.

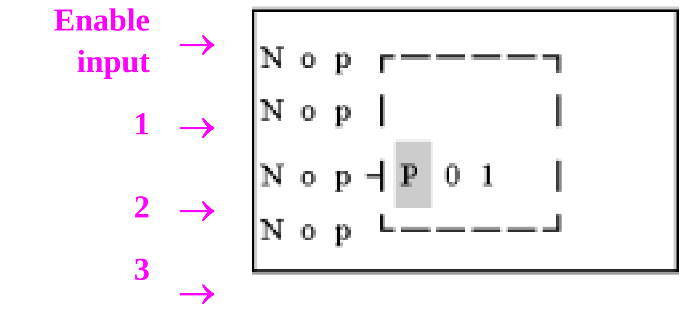
7-1 Coil Block Diagram



(1) Bound

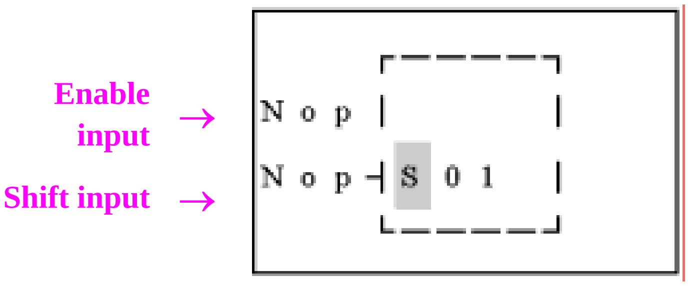
	①Input Terminal	③Output Coil	Range
Input	I		I01~I0C(12)
Expansion Input	X		X01~X0C(12)
Output	Q	Q	Q01~Q08(8)
Expansion Output	Y	Y	Y01~Y0C(12)
auxiliary	M	M	M01~M0F(15)
Knob	N	N	N01~N0F(15)
HMI		H	H01~H0F(15)
PWM		P	P01(1)
SHIFT		**S**	**S01(1)**
I/O LINK		L	L01~L08(8)
Logic /Function Block	B		B01~B99(99)
Normal ON	Hi		
Normal OFF	Lo		
No Connection	Nop		

(2)PWM Function Block Description

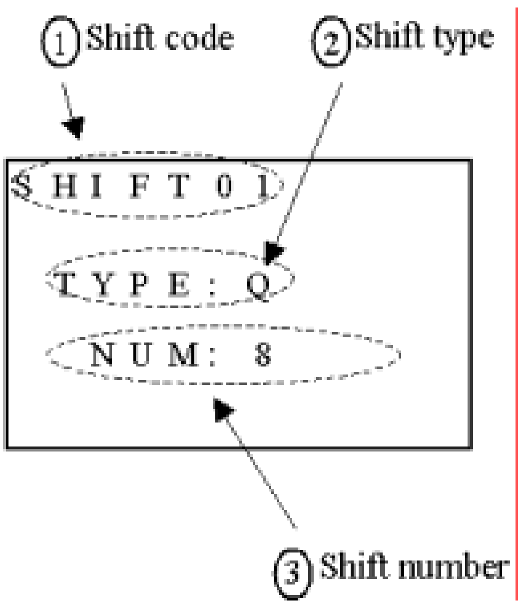


(3)SHIFT Function Block Description

Input terminal description



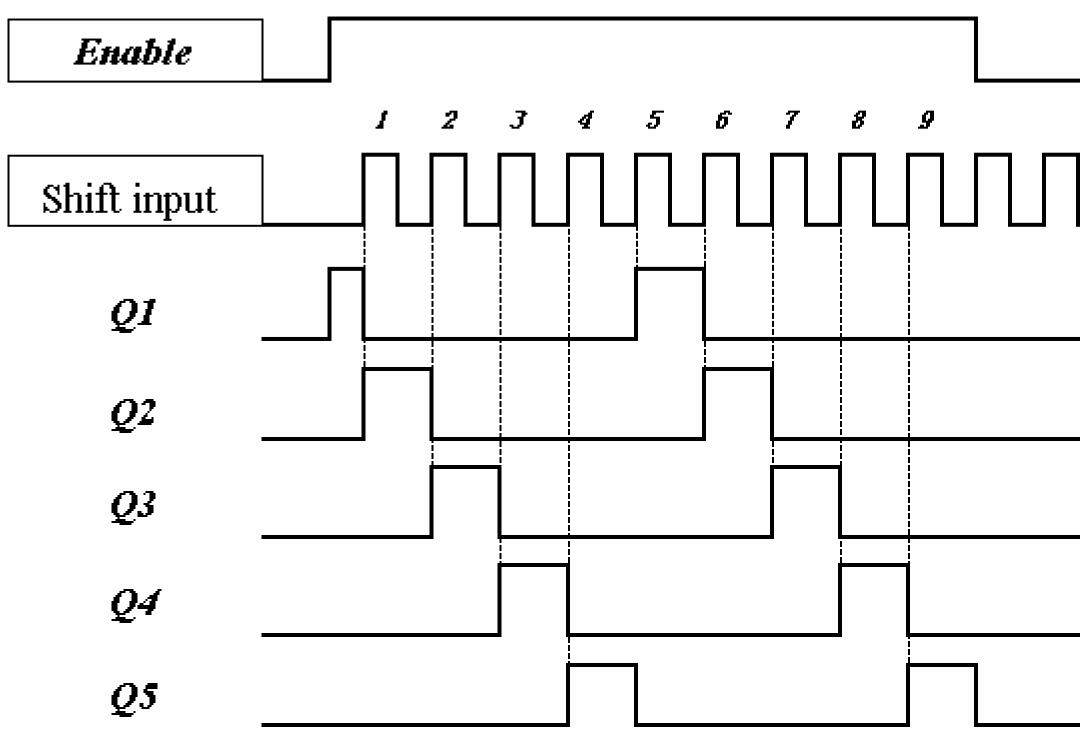
Setting parameter description:



Symbol	Description
①	SHIFT code (Total 1 group)
②	Set output type (Q,Y)
③	Set output shift number (1~8)

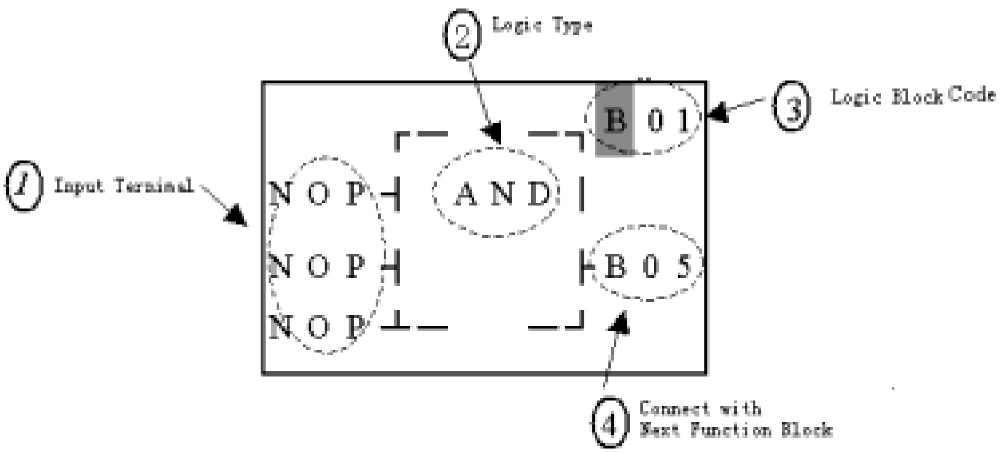
Example:

②= *Q* , ③= *5* Shift ouput range: *Q1~Q5*



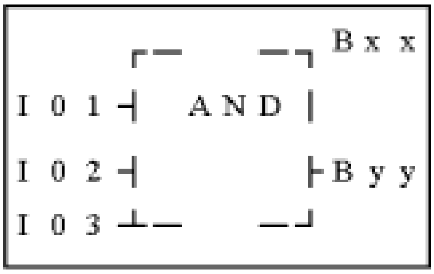
Note：When Enable is available, Q1 ON, Q2~Q4 will be OFF, till the first shift input raise edge, Q2 ON, Q1 and Q3~Q5 OFF. The next output coil will be on when meeting the each raise edge and others are OFF.

7-2 Edit Block



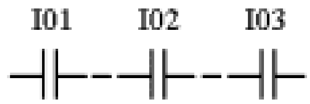
(1)AND Logic Diagram

FBD:



→

LADDER:



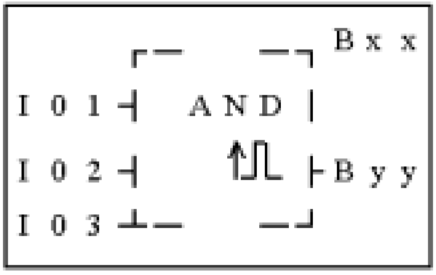
I01 And I02 And I03

Note：The input terminal is NOP

which is equivalent to ‘ Hi’

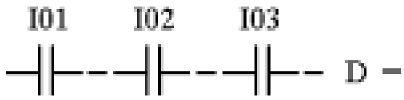
(2)AND (EDGE) Logic Diagram

FBD:



→

LADDER:



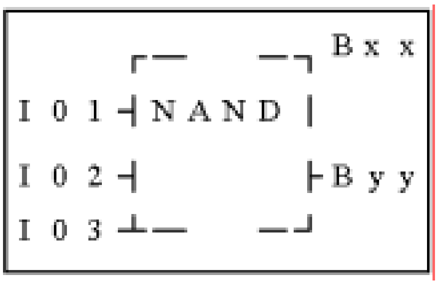
I01 And I02 And I03 And D

Note：The input terminal is NOP

which is equivalent to ‘ Hi’

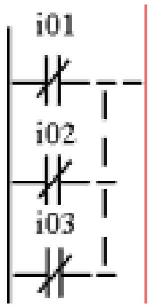
(3)NAND Logic Diagram

FBD:



→

LADDER:



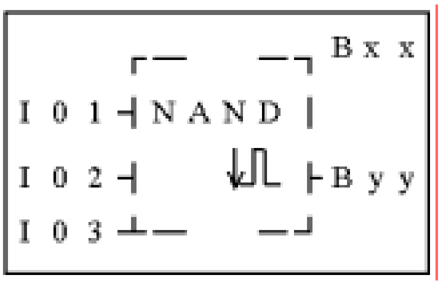
Not(I01 And I02 And I03)

Note：The input terminal is NOP

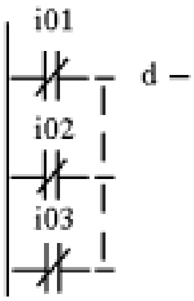
which is equivalent to ‘ Hi’

(4)NAND (EDGE) Logic Diagram

FBD: LADDER:



→



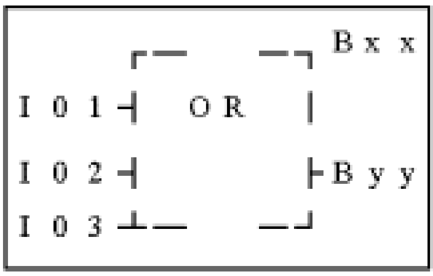
Not(I01 And I02 And I03) And d

Note：The input terminal is NOP

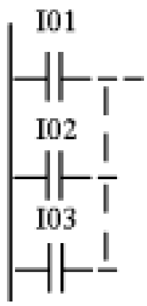
which is equivalent to ‘ Hi’

(5)OR Logic Diagram

FBD: LADDER:



→



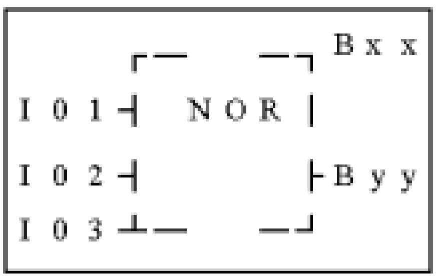
I01 or I02 or I03

Note：The input terminal is NOP

which is equivalent to ‘ Lo’

(6)NOR Logic Diagram

FBD: LADDER:



→

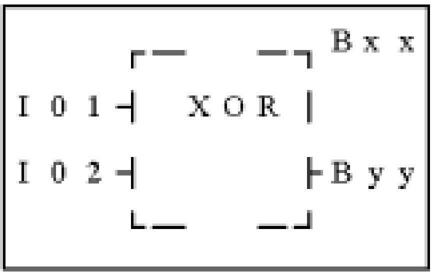
Not (I01 or I02 or I03)

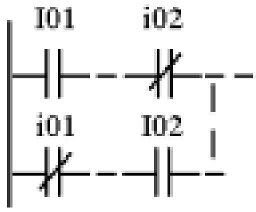
Note：The input terminal is NOP

which is equivalent to ‘ Lo’

(7)XOR Logic Diagram

FBD: → LADDER:





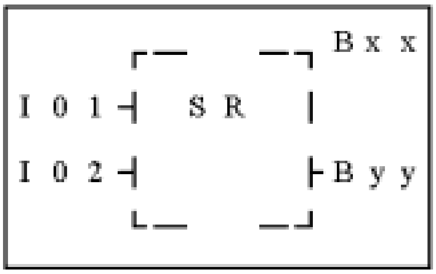
I01 Xor I02

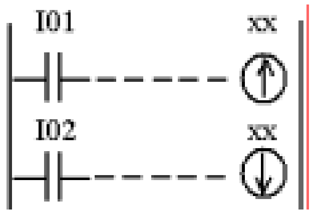
Note：The input terminal is NOP

which is equivalent to ‘ Lo’

(8)SR Logic Diagram

FBD: → LADDER:





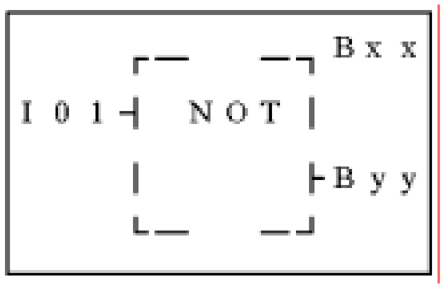
Logic Table

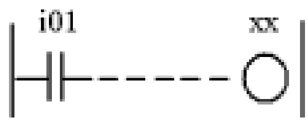
I01	I02	Bxx
0	0	holding
0	1	0
1	0	1
1	1	0

Note：The input terminal is NOP which is equivalent to ‘ Lo’

(9)NOT Logic Diagram

FBD: → LADDER:





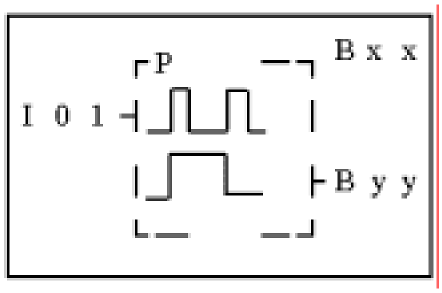
Not I01

Note：The input terminal is NOP

which is equivalent to ‘ Hi’

(10)Pulse Logic Diagram

FBD: LADDER:

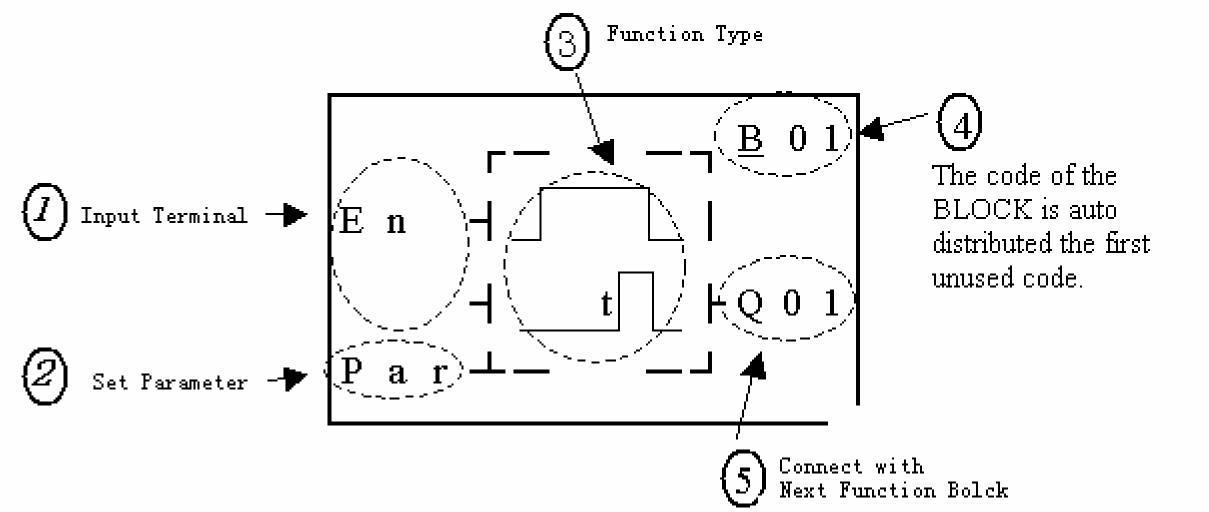


→

Note：The input terminal is NOP

which is equivalent to ‘ Lo’

7-3 Function Block



The function blocks are classified into 4 sorts: Time, Counter, RTC Comparator ‘ R’ and Analog Comparator ‘ G’. The Operation Fundamental is similar to LADDER Function Block’s.

7-3-1 **Common Counter Function Block**

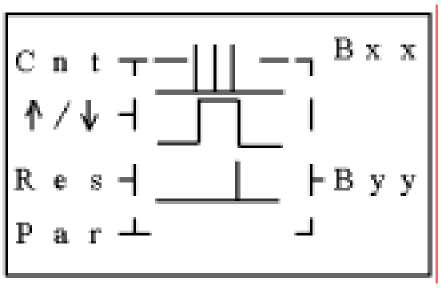
(1) Counter Mode 1

Counting Input →

Up/Down Counting →

Reset →

Counting Parameter →



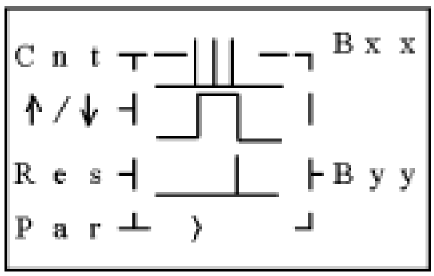
(2) Counter Mode 2

Counting Input →

Up/Down Counting →

Reset →

Counting Parameter →



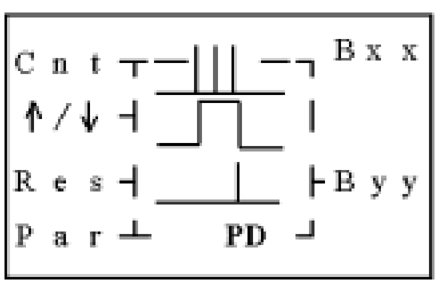
(3) Counter Mode 3

Counting Input →

Up/Down Counting →

Reset →

Counting Parameter →

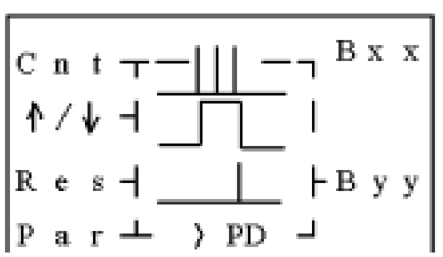


(4) Counter Mode 4

Counting Input →

Up/Down Counting →

Reset →



Counting Parameter →

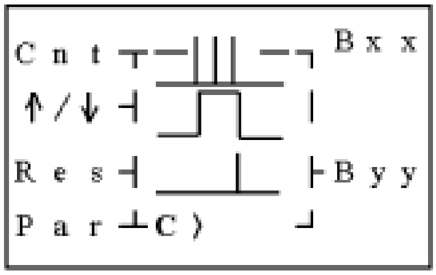
(5) Counter Mode 5

Counting Input →

Up/Down Counting →

Reset →

Counting Parameter →



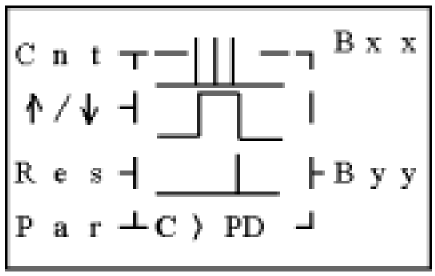
(6) Counter Mode 6

Counting Input →

Up/Down Counting →

Reset →

Counting Parameter →



7-3-2 **High Speed Counter Function Block**

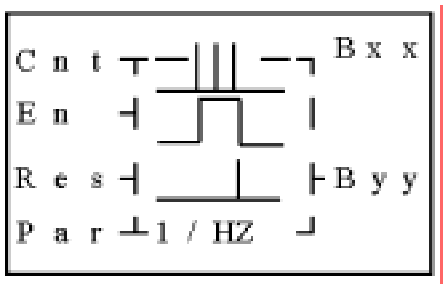
(1) Counter Mode 7

High counting input →

Enable Input →

Reset →

Counter Parameter →



Note ：High speed input terminal I1,I2

(2) Counter Mode 8

High counting input →

Enable Input →

Reset

Counter Parameter →

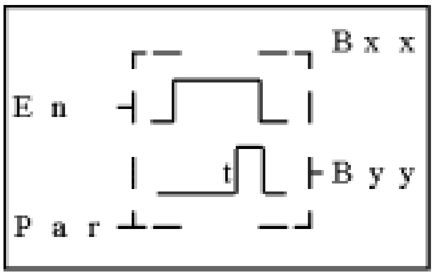
Note ：High speed input terminal I1,I2

7-3-3 Timer Function Block

(1) Timer mode 1 (ON-Delay A Mode)

Enable Input →

Timing Parameter →

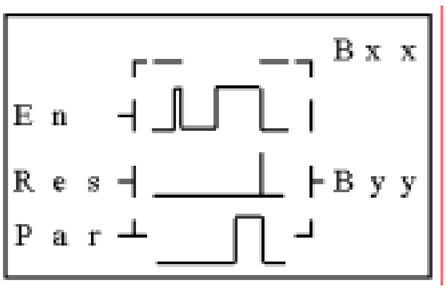


(2) Timer mode 2 (ON-Delay B Mode)

Enable Input →

Reset →

Timing Parameter →

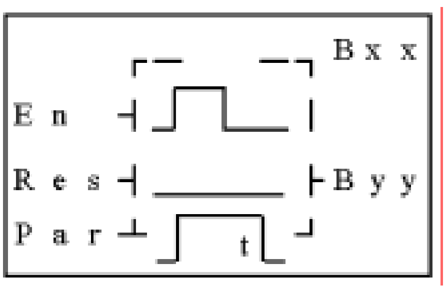


(3) Timer mode 3 (OFF-Delay A Mode)

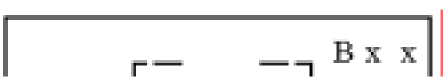
Enable Input →

Reset →

Timing Parameter →



(4) Timer mode 4(OFF-Delay B Mode)



Enable Input →

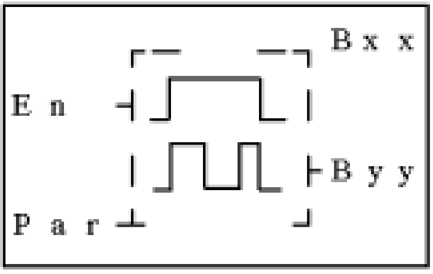
Reset →

Timing Parameter →

(5) Timer mode 5(FLASH A Mode)

Enable Input →

Timing Parameter →

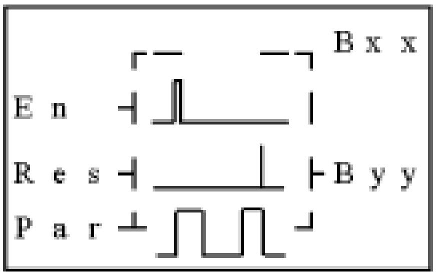


(6) Timer mode 6(FLASH B Mode)

Enable Input →

Reset →

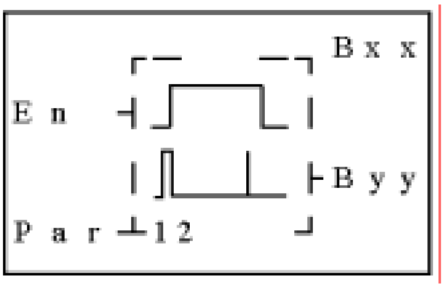
Timing Parameter →



(7) Timer mode 7(FLASH C Mode)

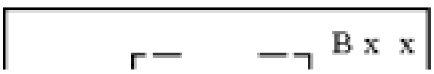
Enable Input →

Timing Parameter →



7-3-4 RTC Comparator Function Block

(1) RTC Mode 1(Daily)



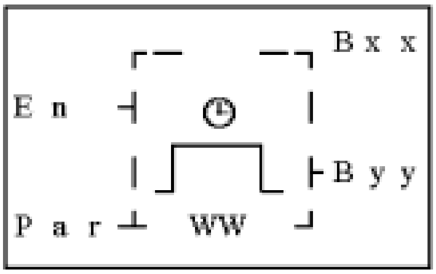
Enable Input →

RTC Parameter →

(2) RTC Mode (Continuous)

Enable Input →

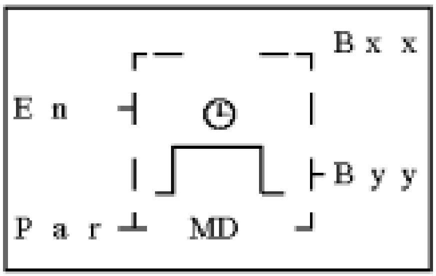
RTC Parameter →



(3) RTC Mode 3 (Year Month Day)

Enable Input →

RTC Parameter →



7-3-5 **Analog comparator Function Block**

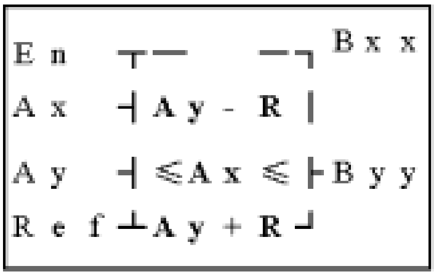
(1) Analog Comparison Mode 1

Enable Input →

Analog Input →

Analog Input →

Reference →



(2) Analog Comparison Mode 2

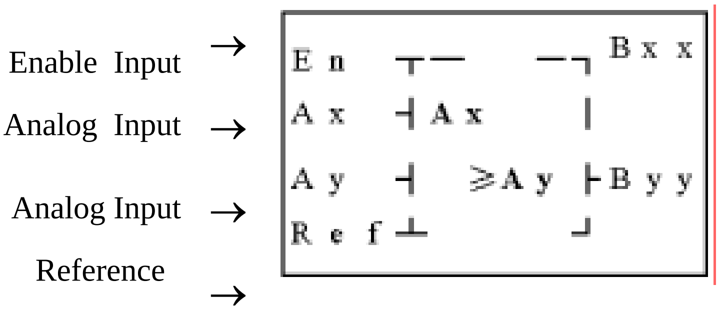
Enable Input →

Analog Input →

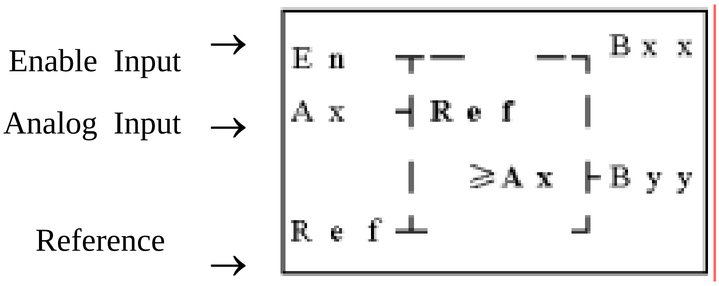
Analog Input →

Reference →

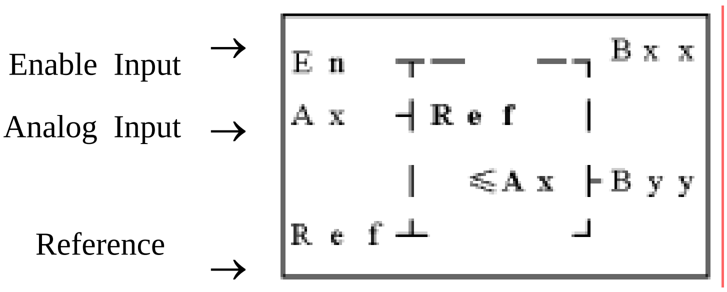
(3) Analog Comparison Mode 3



(4) Analog Comparison Mode 4



(5) Analog Comparison Mode 5



7-4 FBD Block Resource

Under FBD edition mode, the logic block and function block shared the system memory. The total memory and shared memory is showed below.

	Function	Timer	Counter	RTC	Analog

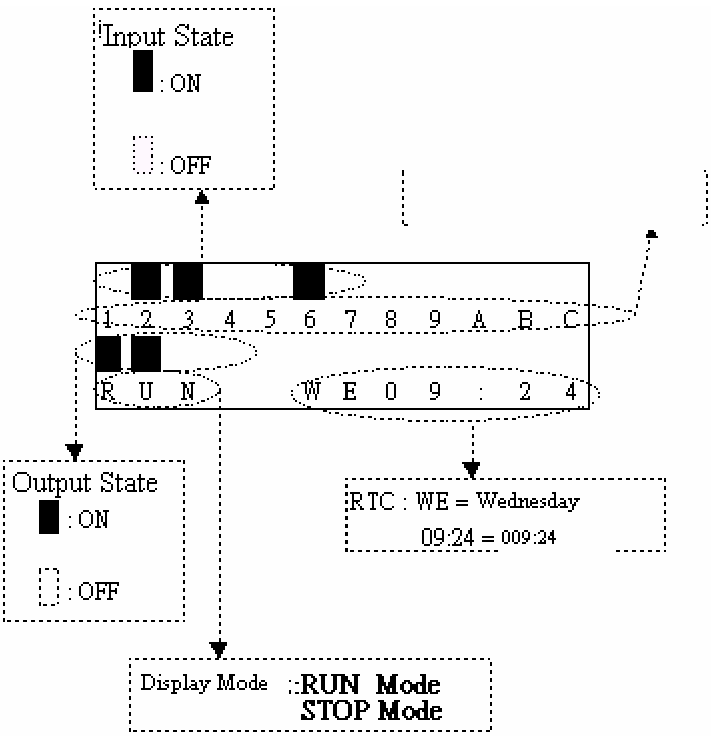
	Block			Comparator	Comparator
Total Memory	99	15	15	15	15
Logic Block	1				
Timer Mode 1~6	1	1			
Timer Mode 7	1	2			
Counter Mode 1~8	1		1		
RTC Comparator Mode 1~3	1			1	
Analog Comparator Mode 1~5	1				1

Sample for calculate the memory in using:

When the FBD program contains 2 AND, 1 OR (Logic Block), 2 Timers Mode 1, 1 Counter Mode 7, RTC comparator Mode 1(Function Block), the total Diagram Blocks used are 2+ 1+ 2+ 1+ 1= 7, and the remained is 99-7= 92. The timer used is 2+ 2= 4, and the remained is 15-4= 11. The counter used is 1, and the remained is 15-1= 14. The RTC comparator used is 1,and the remained is 15-1= 14. The analog comparator is unused, so the usable are 15.

7-5 FBD Edit Method

7-5-1 the origin screen when the power is on.



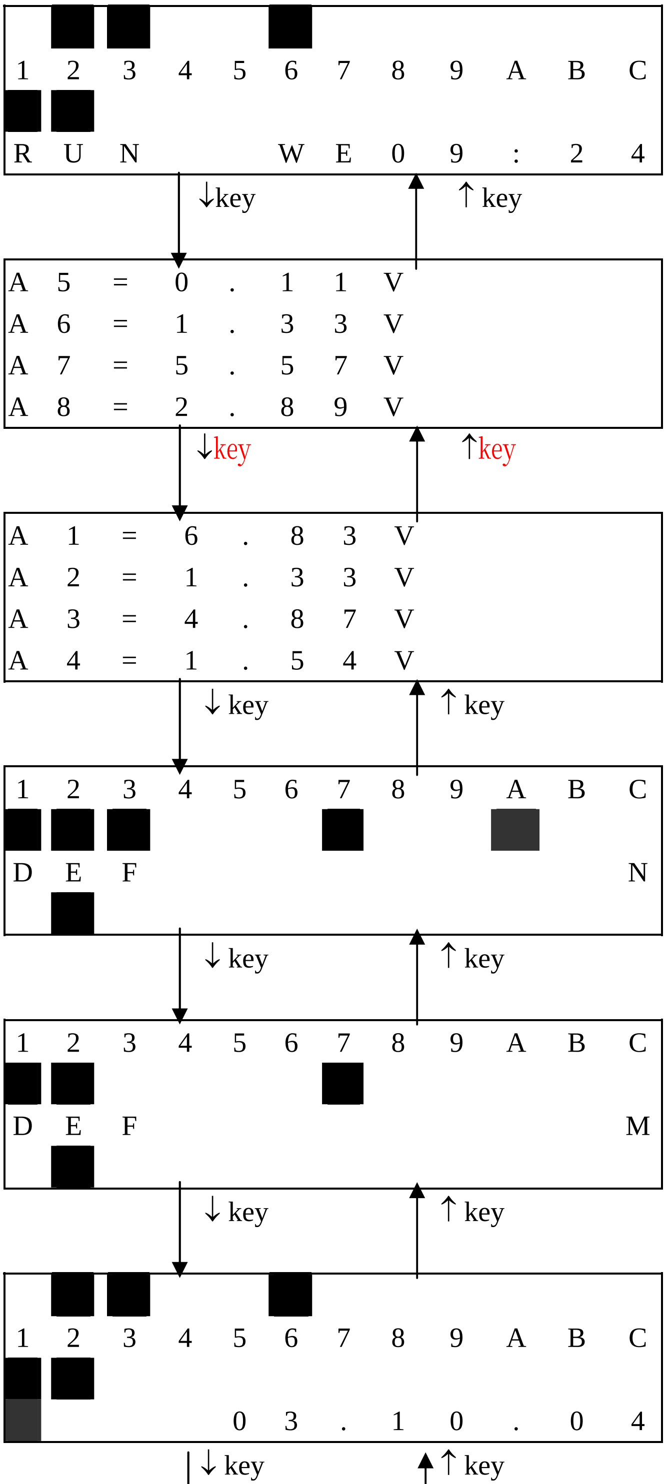
Now Press：

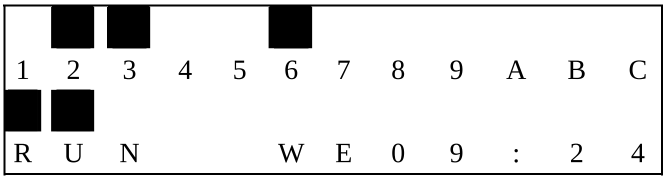
ESC	Back to Main Menu
↑↓	Display the state of the other relays(Expansion X&Y⇔M ⇔ N⇔A) ⇔

	Original Screen
SEL	Press for 3s, H function content will be displayed, except the Mode 2 is selected in HMI.

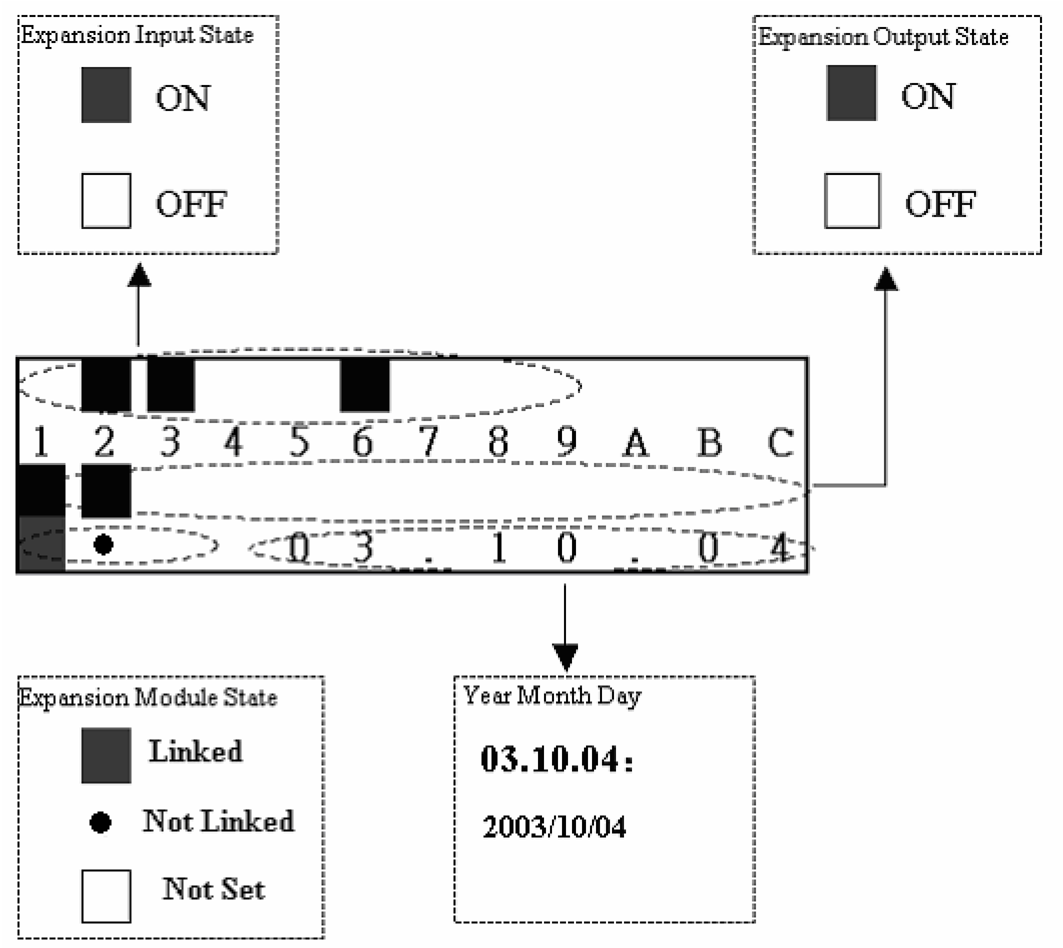
Sample：

a) operation for displaying the state of other relay.。

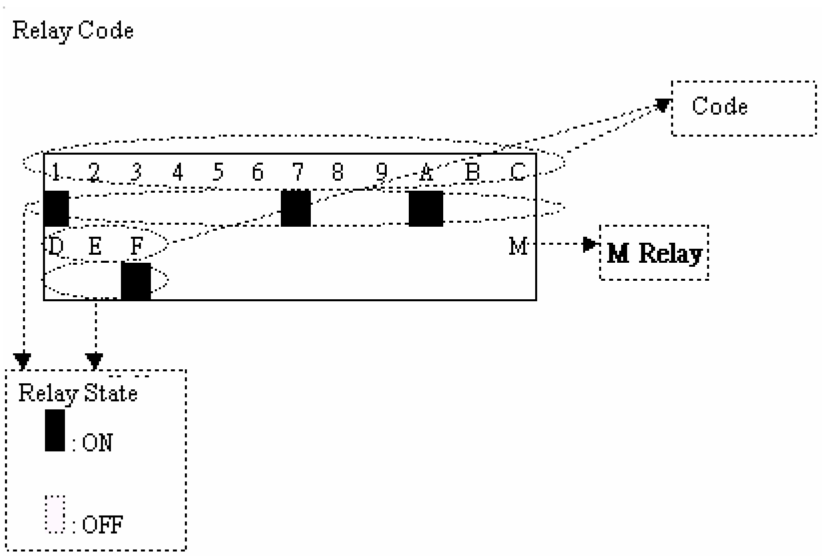




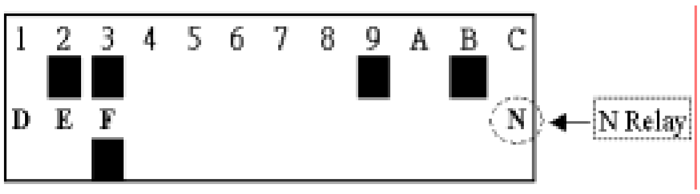
① Expansion Display State



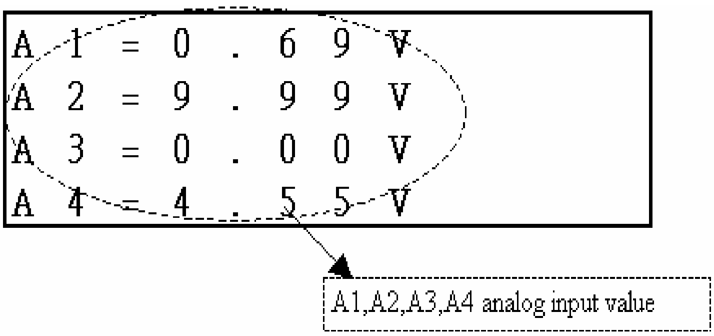
② M Display State：



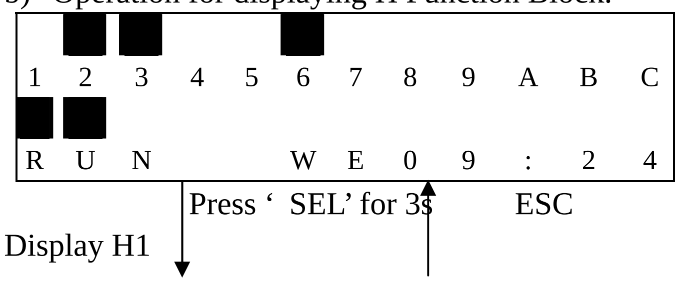
③ N Display State：

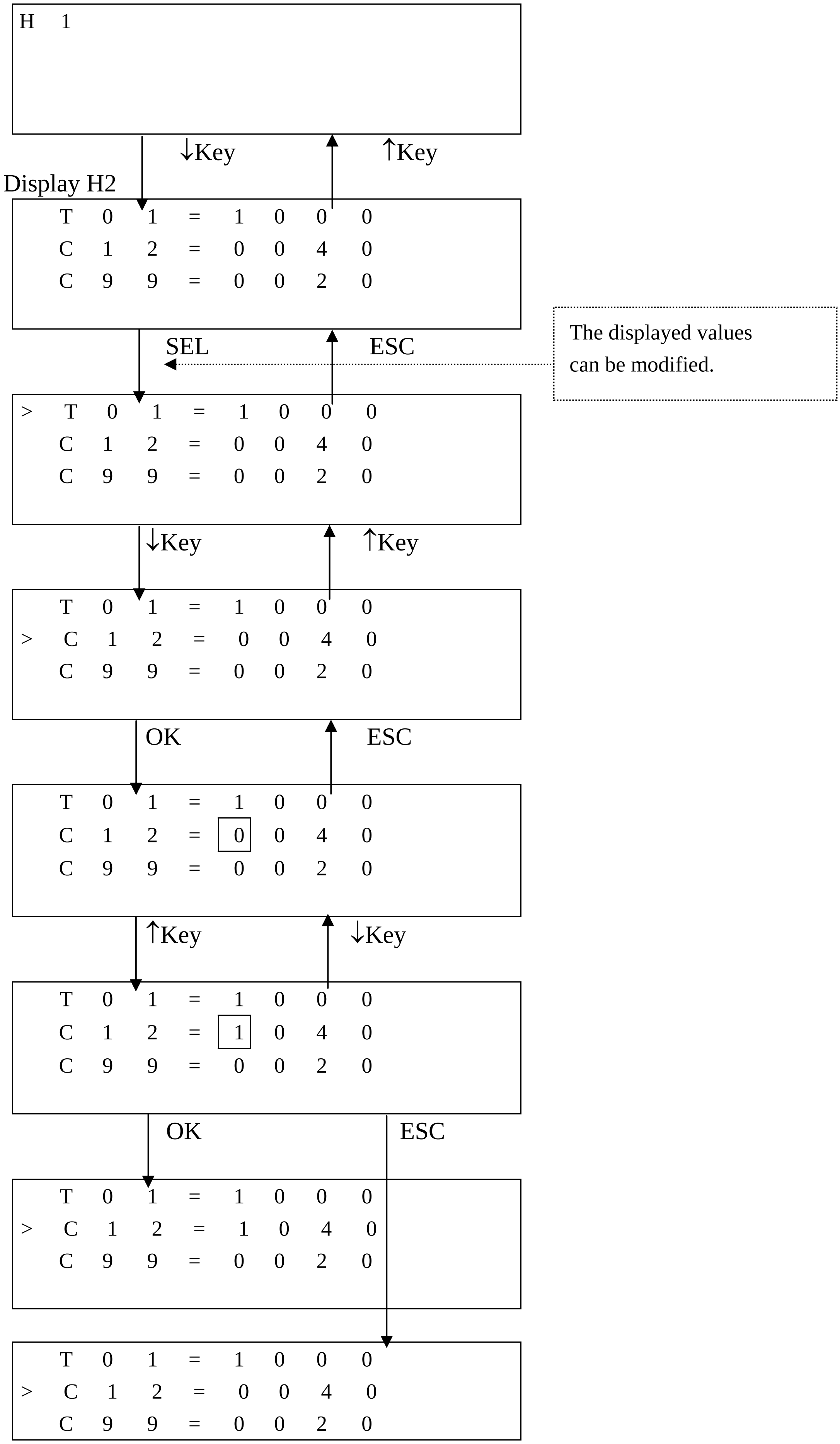


④ Analog input



b) Operation for displaying H Function Block.




H 1
↓Key
↑Key
Display H2
T 0 1 = 1 0 0 0
C 1 2 = 0 0 4 0
C 9 9 = 0 0 2 0
SEL
ESC
The displayed values can be modified.
> T 0 1 = 1 0 0 0
C 1 2 = 0 0 4 0
C 9 9 = 0 0 2 0
↓Key
↑Key
T 0 1 = 1 0 0 0
> C 1 2 = 0 0 4 0
C 9 9 = 0 0 2 0
OK
ESC
T 0 1 = 1 0 0 0
C 1 2 = 0 0 4 0
C 9 9 = 0 0 2 0
↑Key
↓Key
T 0 1 = 1 0 0 0
C 1 2 = 1 0 4 0
C 9 9 = 0 0 2 0
OK
ESC
T 0 1 = 1 0 0 0
> C 1 2 = 1 0 4 0
C 9 9 = 0 0 2 0
T 0 1 = 1 0 0 0
> C 1 2 = 0 0 4 0
C 9 9 = 0 0 2 0

7-5-2 Main Menu Screen
LCD displays 4 lines Main Menu selection

(1) When SG2 is under STOP mode, the main selection displays:

> FBD PARAMETER RUN CLEAR PROG. WRITE READ SET RTC SET ANALOG SET PASSWORD LANGUAGE INITIAL	→ Similar to Ladder Edit Mode.

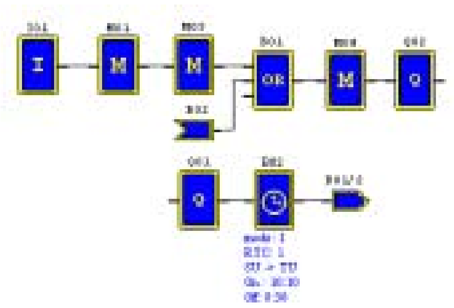
(2) When SG2 is under RUN mode, the main selection displays:

> FBD PARAMETER STOP WRITE RTC SET WRITE PASSWORD LANGUAGE	→ Similar to Ladder Edit method.

Now Press:

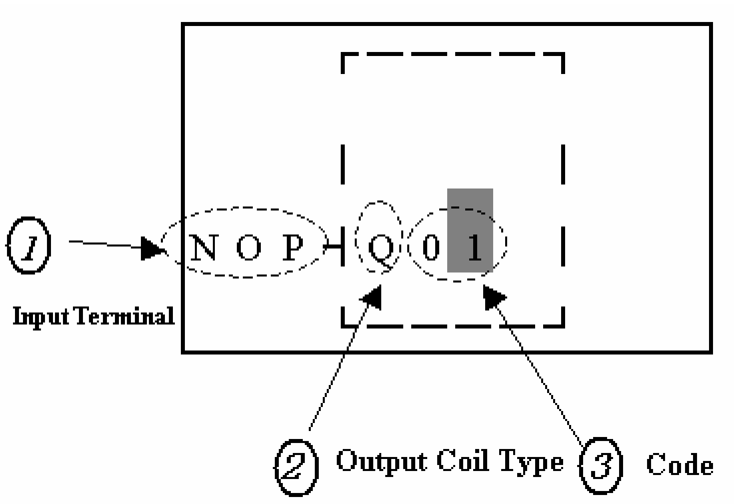
↑ ↓	Move the Cursor to select the Main Menu Items
OK	Confirm to enter the selected items
ESC	Back to original screen

◎ **FBD For Main Screen**



This diagram is just reference for following operation description

(1) Output coil display



Now Press

← →	1. Move the cursor①⇔②⇔③ 2. ①is Bxx, press '←' to enter Bxx screen
↑ ↓	1. Modify the code-③ (Q : 01~08 , Y : 01~0C , M ,N , H : 01 ~ 0F , L : 01~08 , P : 01 ,S : 01) 2. modify output coil type-② (Q⇔Y⇔M⇔N⇔H⇔L ⇔P⇔S ⇔Q)
OK	1. ②, ③ confirm the output coil (as Q,Y,M,N,), the cursor move to ①
ESC	1. Back to Main Menu

Sample:

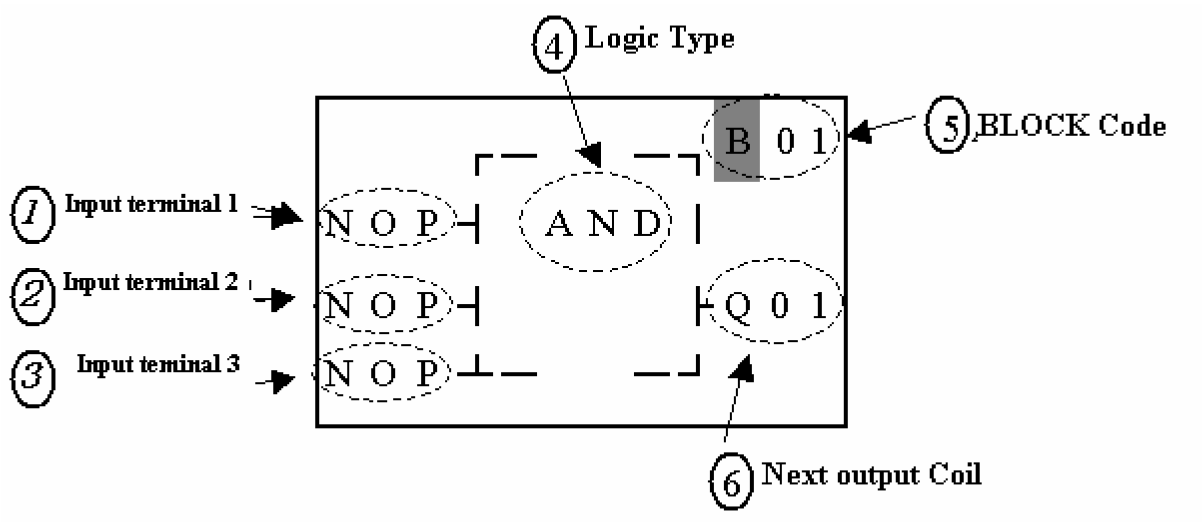
Procedure (1)-1 Original Screen	— — — — N O P Q 0 1 — — — —

Procedure (1)-2 Press '←'	— — — — N O P Q 0 1 — — — —

Procedure (1)-3	

Press '↑' twice to modify Q as M Press '↓' twice to recover M as Q	— — — — I 0 1 M 0 1 — — — —
Procedure (1)-4 Press '→'	— — — — I 0 1 M 0 1 — — — —
Procedure (1)-5 Press '↓' for 7 times to modify 1 as 9	— — — — B 0 1 M 0 9 — — — —
Procedure (1)-6 Press ' OK' Confirm coil M09, The cursor auto move to input terminal	— — — — B 0 1 M 0 9 — — — —
Procedure (1)-7 Press '←' Enter B01 Screen	B 0 1 M 0 3 O R B 0 2 M 0 9 N O P

(2) Nr Input terminal Screen (such diagram is only available for query, display the Nr input contact of FBD program in SG2 Client software.)



Now Press

← →	1. Press ←: ⑤⇒① ; press →: ①⇒⑤ ; 2. If ①②③ is Bxx, press ← to enter Bxx screen 3. If active cursor is located as the diagram , press → to enter next output coil screen ⑥.
↑ ↓	Press ↑ ↓: ①⇔②⇔③⇔⑤⇔①
ESC	Back to Main Menu

Sample:

Following step (1)-7 :

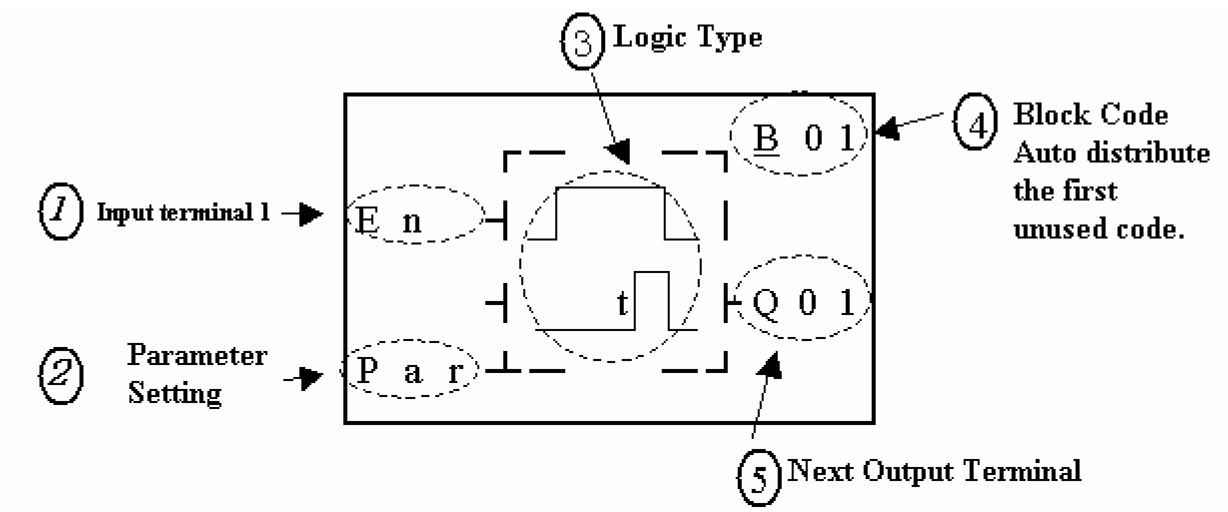
Procedure (2)-1 Press '←' or '↓'	B 0 1 M 0 3 O R B 0 2 M 0 9 N O P

Procedure (2)-2 Press '↓' once	B 0 1 M 0 3 O R B 0 2 M 0 9

	N O P

Procedure (2)-3 Press '←' Enter B02 screen	B 0 1 M 0 3 O R B 0 2 M 0 9 N O P

(3) Display Screen for Bn input terminal（such diagram is only available for query, display the Bn input contact of FBD program in SG2 Client software.）



Now press

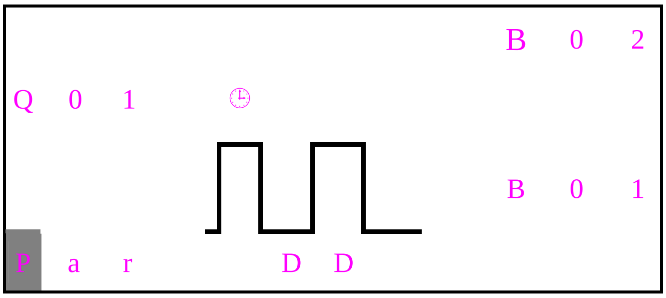
↑↓	Press ↑↓: the cursor ①⇔②⇔④⇔①
←→	1. press ←: ④⇒① ; then →: ①⇒④ ; 2. If ①②③ is Bxx, press ← to enter Bxx screen. 3. When active cursor locates at ④, press → to enter next screen of output coil⑤.
OK	1. When the cursor locates at ②, press OK to enter parameter edit screen.
ESC	1. At parameter edit screen, press ESC to exit and back to function block screen. 2.At function block screen, press ESC to back to main menu.

Sample:

Following the procedure (2)-3,

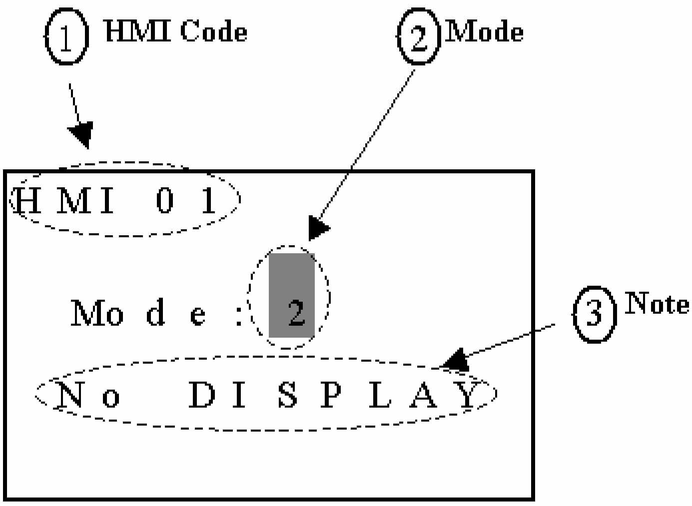
Procedure (3)-1	

Press '↓' twice



Procedure (3)-2 Press ' OK' Enter Parameter setting screen Refer to 2 Parameter of Main Menu	**B 0 2 : R** **O N S U 1 0 : 1 0** **O F F T U 0 8 : 3 0**

(4) HMI Setting Screen

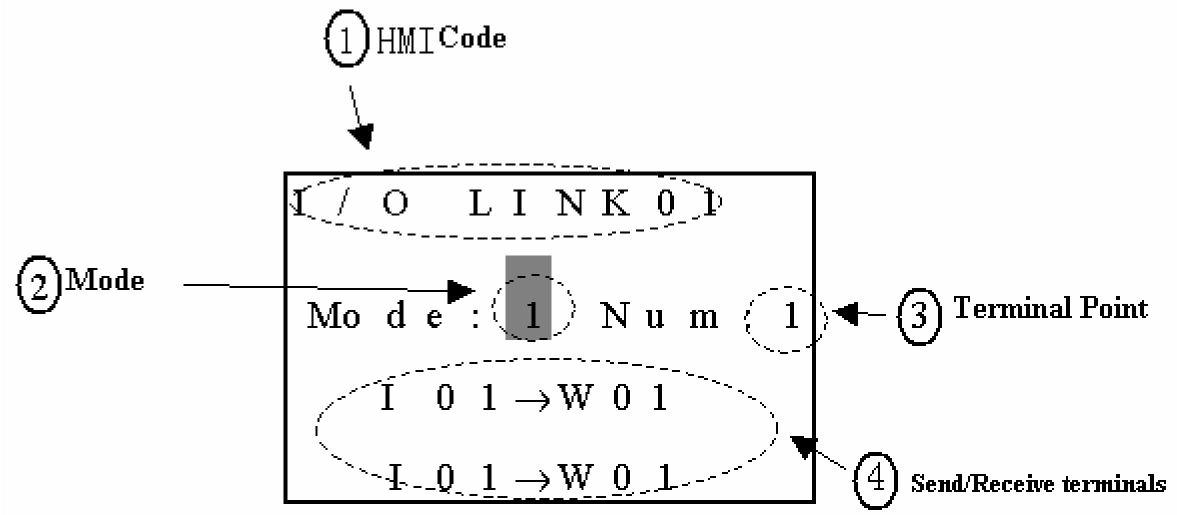


Now press

SEL	Edit the mode
SEL +↑ ↓	Modify the mode (1~2)
OK	Save the modified mode after press ' SEL'.
ESC	1. Cancel the modified content after press ' SEL'. 2. Back to edit screen for coil(1)

Note：HMI text content setting should use CLIENT only.

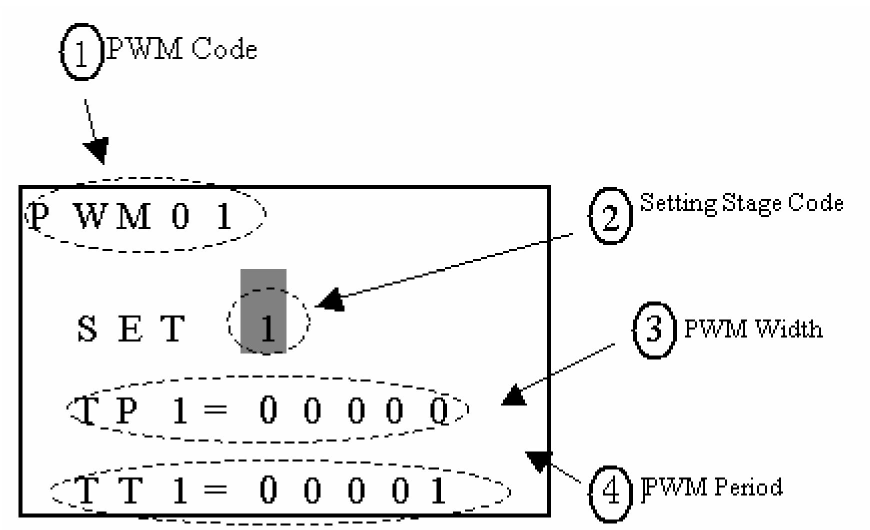
(5) I/O LINK setting screen



Now press

←→↑↓	Move the cursor ②⇔③⇔④
SEL	Begin to edit
SEL + ↑ ↓	1. ②Modify the mode (1~2) 2. ③modify the terminals point (1~8) 3. ④ modify the send/ receive terminals (I01~I0C,X01~X0C,Q01~Q08, Y01~Y0C,M01~M0F,N01~N0F)
OK	Save the modified content after press ‘ SEL’
ESC	1.Cancel the modified content after press ‘ SEL’ 2. Back to edit screen(1) for coil

(6) PWM Setting screen

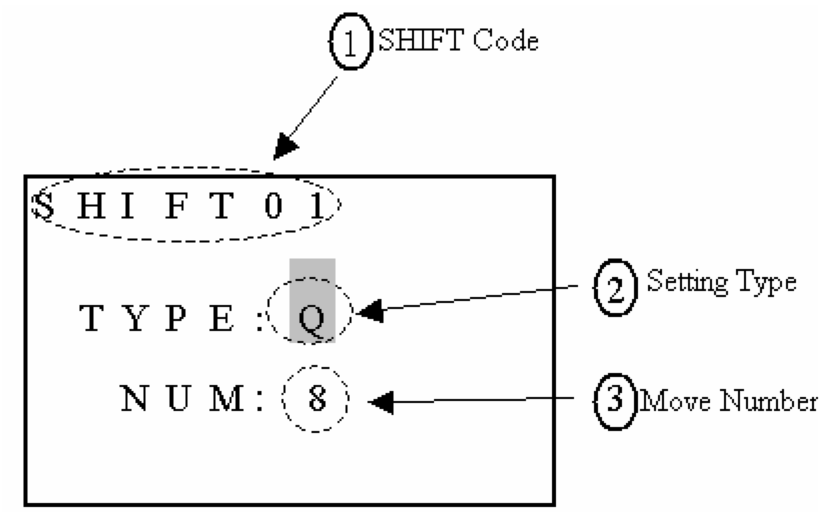


Now press

↑↓	Move the cursor ②⇔③⇔④
←→	③,④move the cursor
SEL	Begin to edit

SEL 後 ↑ ↓←→	1.② modify the setting stage (1~8) 2.③ modify the pulse width(00000~32768) 3. ④modify the period (00001~32768)
OK	Save the modified content after press ' SEL'
ESC	1.Cancel the modified content after press ' SEL' 2. Back to edit screen(1) for coil

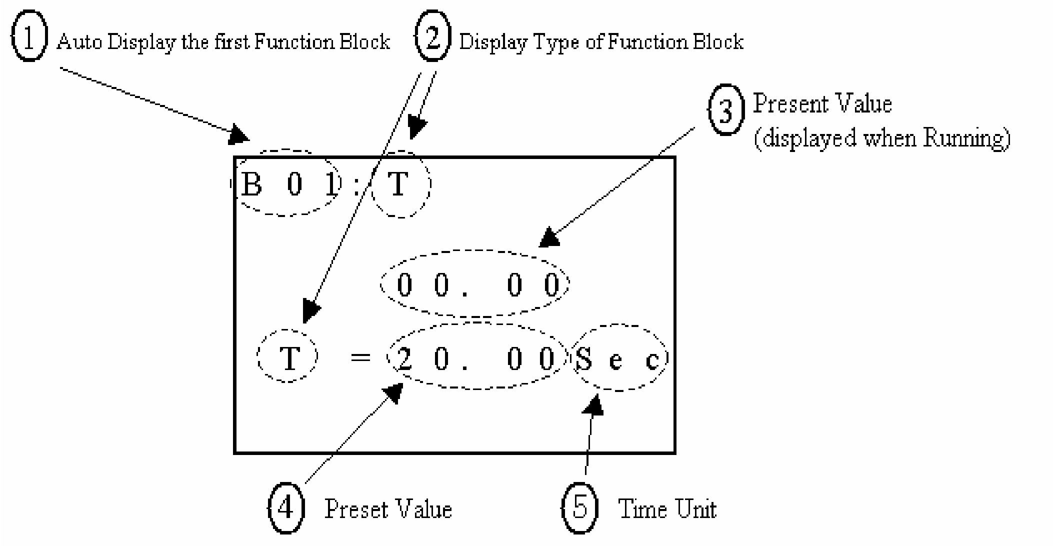
(7) SHIFT setting screen



Now press

↑↓	Move the cursor ②⇔③
SEL	Begin to edit
SEL , then ↑ ↓	1. ② modify the output type Q⇔Y⇔Q 2. ③ modify the move coil number (1~8)
OK	Save the modified content after press ' SEL'
ESC	1.Cancel the modified content after press ' SEL' 2. Back to edit screen (1) for coil

◎ PARAMETER of Main Menu (All the parameter of the used function block in editing FBD program with SG2 Client software can be queried and modified.)



Now Press:

← →	1. ① display the previous / next Function Block Parameter 2. ④, ⑤ move the cursor
↑ ↓	1. move the cursor from to 2. move the cursor from , to
SEL then ↑ ↓	Timer: 1. ④ modify the setting value (0000~9999) 2. ⑤ modify the time unit (0.01s⇔0.1s⇔1s⇔1min) Counter: Modify preset value.
SEL	numerical value →A1→T1→C1→ numerical value
OK	Save the modified data after press ' SEL'
ESC	1. Cancel the modified data after press ' SEL' 2. Back to Main Menu.

FDB PARAMETER modifying step:

Take timer (mode 1) as an example: Analog input A4 is set as preset value. Time unit is s.

Step 1 **Press '↑ ↓'** **Move the cursor to default place**	**B 0 1 1 : T 2** **T = 0 0 . 0 0 S**

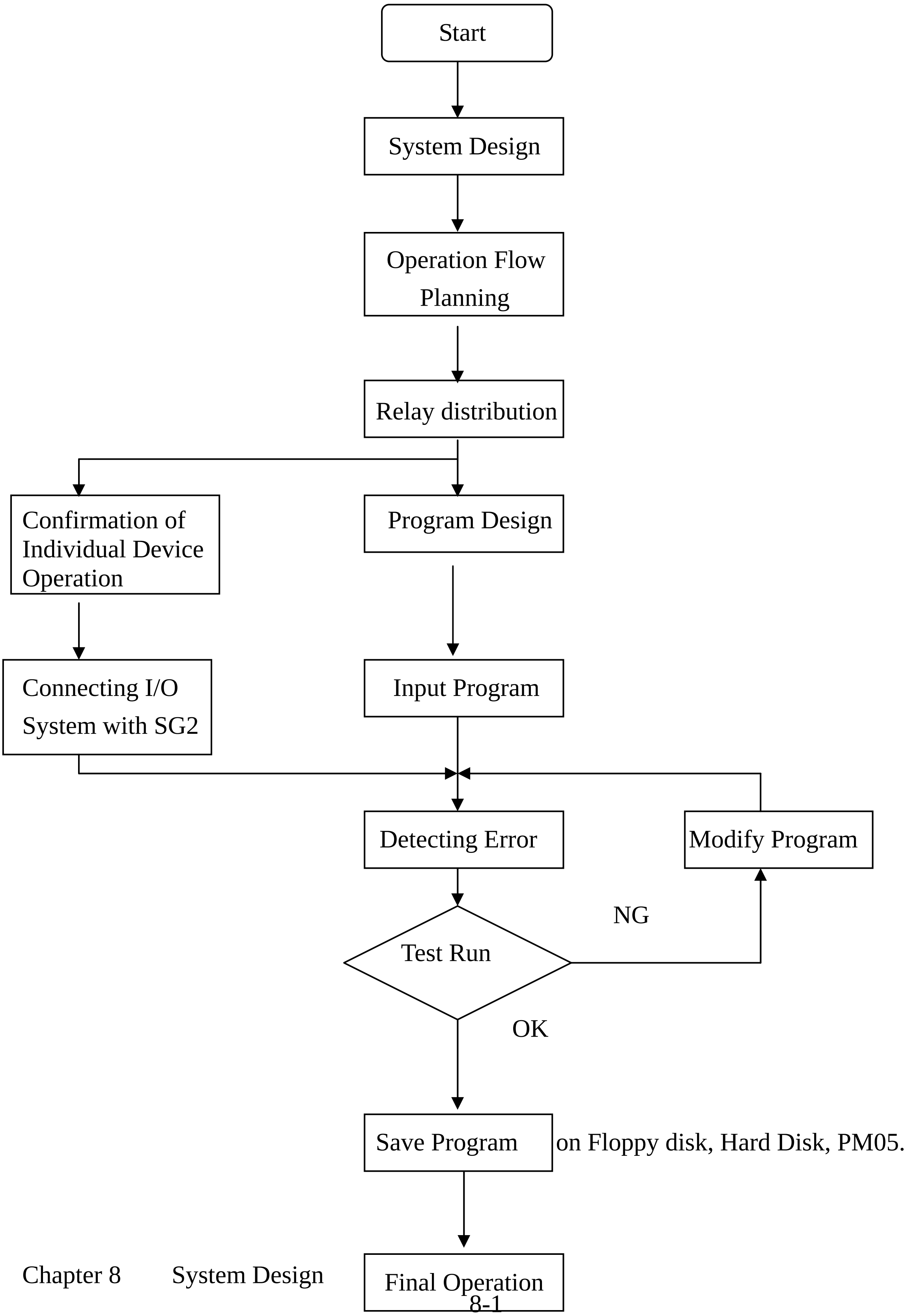
Step 2 **Press 'SEL' twice**	**B 0 1 1 : T 2**

	T = A 1 S
Step 3 Press '↑' for three times, change toA2~A4 in turn	B 0 1 1 : T 2 T = A 4 S
Step 4 Press OK to save present data.	B 0 1 1 : T 2 T = A 4 S

Content

Chapter 8 System Design

8-1 Procedure for system design



8-2 Consideration for System Design

SG2 differs from the traditional Relay in controlling circuit fundamental. SG2 is periodical-loop controlled circuit (series controlled circuit), while Relay is parallel controlled circuit. Consequently, whenever the trouble took place, it is only single relay invalidation in Relay, whereas it will affect the whole system in SG2.

Therefore, it is recommended the external protection device to be installed：

① Emergency-Stop Circuit
② Protection Circuit
③ Operation Circuit for High-Voltage Components

8-3 Code Distribution for Relay

(1) 10 Point：

① Input Code：I = 1~6
② Output Code：Q= 1~4

(2) 20 Point：

① Input Code：I = 1~C (12)
② Output Code：Q= 1~8

(3) Expansion Point：

① Input Code：X = 1~C (12)
② Output Code：Y= 1~C (12)

Content

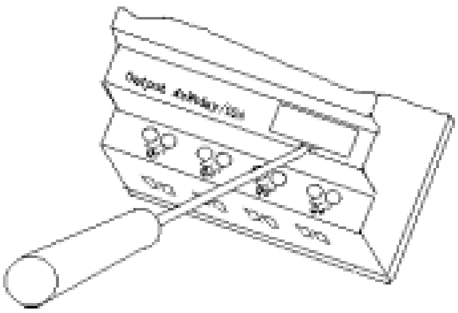
Chapter 9 Spare Program

9-1 Spare Program Cartridge (**PM05**)

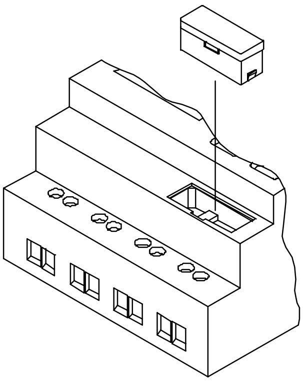
◎. The installation method for PM05 (optional) is as follow

Step1: Confirm cutting off the power supply.

Step 2：Remove the cover of SG2 with the screwdriver, as follow :



Step 3：Plug PM05 **to the slot, as follow :**



Step 4: Put on the power supply

Step 5：In the operation function list, click WRITE to enter the confirmation interface and click YES to download the spare program.（Download the program from SG2 to PM05）

Note：If it is desired to recover the spare program, click READ on the operation function list to enter the confirmation interface and click YES to upload the spare program. (Upload the program from PM05 to SG2).

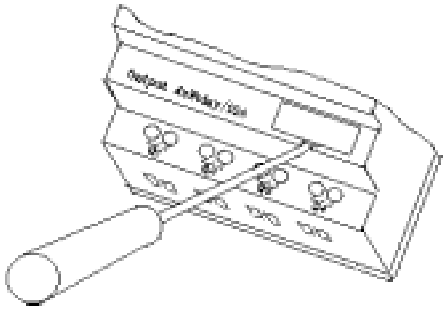
Step 6: Cut off the power supply.

Step 7: Prize up PM05 referring to step 2 and cover the protective cover.

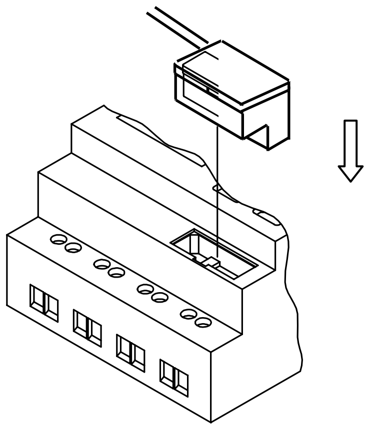
9-2 Computer Write Software (Client)

Step1: Confirm cutting off the power supply.

Step 2：**Remove the cover of SG2 with the screwdriver, as follow:**



Step 3：Insert cable of Client **to the slot, as follow: The other terminal of** Client **cable is connected with the communication port RS-232 on computer.**



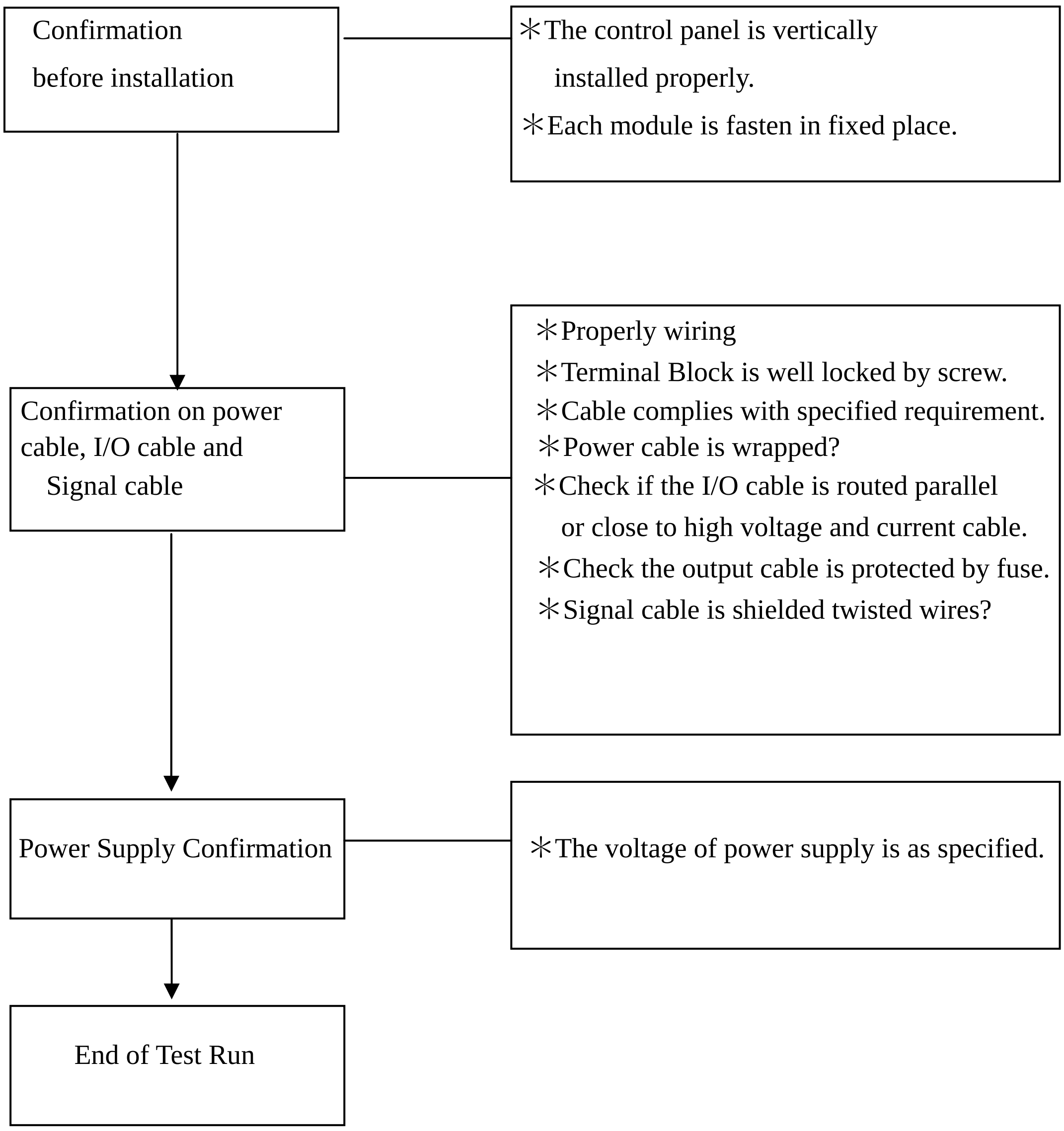
Step 4: put on the power supply

Step 5：With Client software, the computer is ready to read program from or write program to SG2.

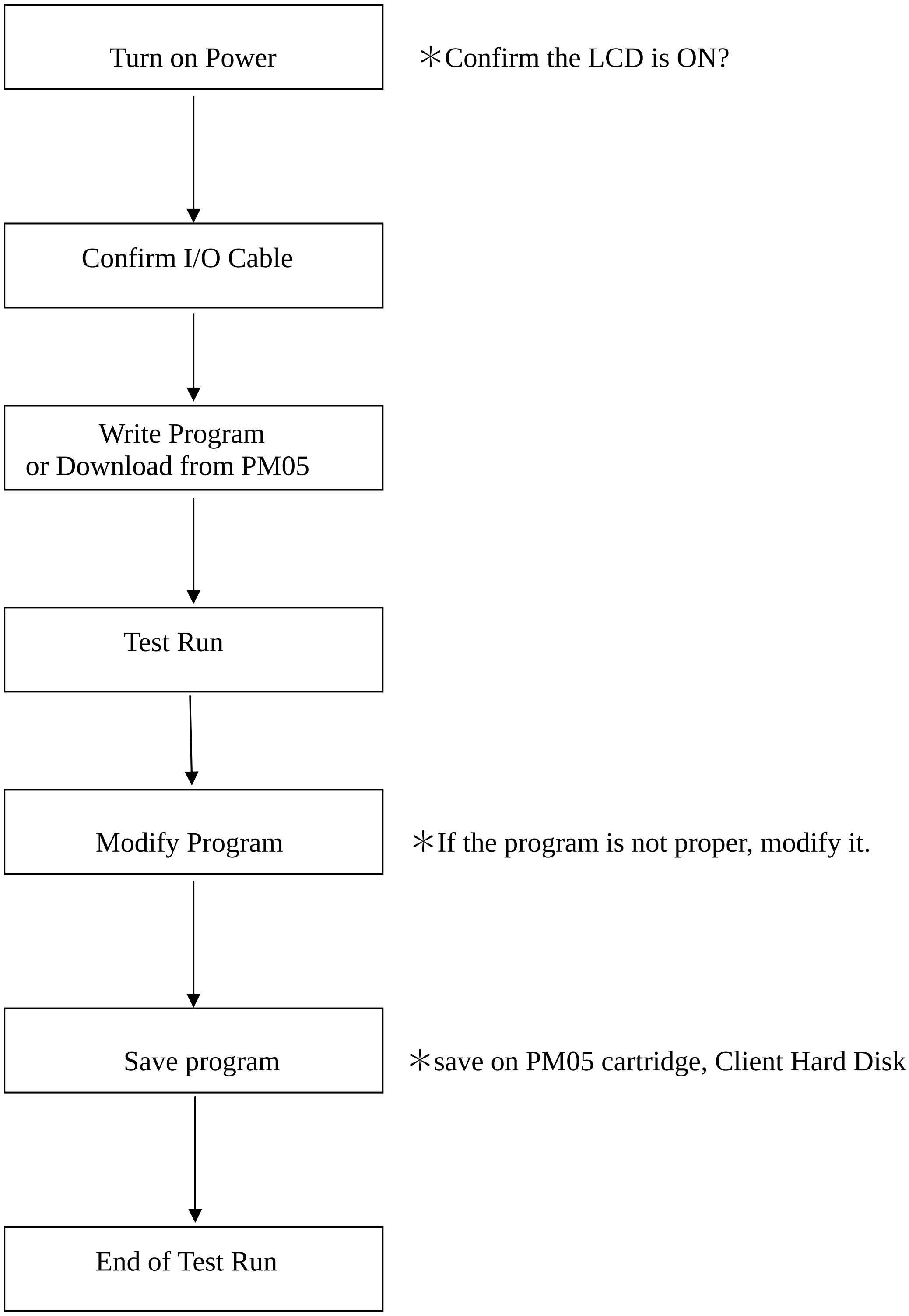
Content

Chapter 10 Test Run

10-1 Confirmation before Test Run



10-2 **Procedure of Test Run**



Content

Chapter 11 Inspection and Maintenance

11-1 Periodic Inspection

◎ General Items

Inspect Item	Inspect content	Standard	Remarks
Ambient temperature	They shall be limited to the specification, the temperature inside the control panel shall equal to the ambient temperature	-20℃-55℃	
Relative humidity		5-90% RH	No Frost
Gas		No corrosive gas exists	
Vibration		None	
Impact		None	

◎ Master

Item	Contents	Standard	Remarks
Power voltage	Check the terminal voltage to ensure that it complies with specification	AC 100-240V	SG2 AC model
DC 24V	Check the terminal voltage to ensure that it complies with specification	DC 24V±10%	SG2 DC model
Input power	Check the input voltage to ensure that it complies with specification	AC 100 – 240V DC 10V – 26.4V	
Output power	Check the output voltage to ensure that it complies with specification	Below AC 250V Below DC 30V	
Installation	The GENIE is firmly fixed	No loose bolts	
	Check the loose screw on the terminal lock	No loose screws	

11-2 Trouble Shooting

◎ When there is no display, but the operation is proper, it might be the trouble in LCD, please consult the distributor for help.

◎ If there is no display and no action, please consult the distributor for help after confirmation of Power Supply ‘ ON’

Content

Chapter 12 Technical Specification

12-1 General Specification

Item		Specification
Method of input program		By means of Ladder / Function Block
Operation Environment	Operation temperature	-20-55℃
	Storage temperature	-40 - 70℃
	Operation humidity	20-90% RH, no frost
	Environmental gas	No corrosive gas exists
Mail Structure	Vibration resistance	IEC60068-2-6 standard 0.075mm amplitude/1.0g acceleration
	Impact resistance	IEC60068-2-27 standard 15g peak, 11ms duration
Noise proofing	ESD	Contact ±4KV, air discharge ±8KV
	EFT	Power DC/AC: ±2KV DC: ±1KV
	CS	0.15~80MHz 10V/m
	RS	80~1000MHz 10V/m
	EMI	EN55011 class B
Installation	Enclosure Protection	IP20
	Fixing method	Direct or Din rail (35mm) installation
	Direction	Please refer to Page 4-3
Size of cable		AWG 12ø3.5mm^2
Dimension		72×90×59.6 mm(W×L×H) Din rail 72×106×59.6 mm(W×L×H) Direct installation

12-2 System Specification

	MODE	Power Supply			DC 24V	Input Point		Output Point	Analog Input	RTC	LCD Key	Expansion	1KHz High Speed Input	PWM Output
		AC 100~240	DC 24V	DC 12V										
10-Point Variant	Expansion Variant													
	10HR-A	◎			6	4	Relay		◎	◎	◎			
	12HR-D		◎		8*	4	Relay	2	◎	◎	◎	◎		
	12HT-D		◎		8*	4	Transistor	2	◎	◎	◎	◎	◎	
	12HR-12D			◎	8*	4	Relay	2	◎	◎	◎	◎		
	Expansion Variant without control panel													
	10KR-A	◎			6	4	Relay		◎		◎			
	12KR-D		◎		8*	4	Relay	2	◎		◎	◎		
	12KT-D		◎		8*	4	Transistor	2	◎		◎	◎	◎	
	12KR-12D			◎	8*	4	Relay	2	◎		◎	◎		
	Standard Variant without up-cover													
	10CR-A	◎			6	4	Relay		◎					
	12CR-D		◎		8*	4	Relay	2	◎			◎		
	12CT-D		◎		8*	4	Transistor	2	◎			◎	◎	
	12CR-12D			◎	8*	4	Relay	2	◎			◎		
20-Point Variant	Expansion Variant													
	20HR-A	◎			12	8	Relay		◎	◎	◎			
	20HR-D		◎		12*	8	Relay	4	◎	◎	◎	◎		
	20HT-D		◎		12*	8	Transistor	4	◎	◎	◎	◎	◎	
	20HR-12D		◎		12*	8	Relay	4	◎	◎	◎	◎		
	Expansion Variant without control panel													
	20KR-A	◎			12	8	Relay		◎		◎			
	20KR-D		◎		12*	8	Relay	4	◎		◎	◎		
	20KT-D		◎		12*	8	Transistor	4	◎		◎	◎	◎	

	20KR-12D		◎		12*	8	Relay	4	◎		◎	◎		
	Standard Variant without up-cover													
	20CR-A	◎			12	8	Relay		◎					
	20CR-D		◎		12*	8	Relay	4	◎			◎		
	20CT-D		◎		12*	8	Transistor	4	◎			◎	◎	
	20CR-12D		◎		12*	8	Relay	4	◎			◎		
	High-speed communication Variant													
	20VR-D		◎		12*	8	Relay	4	◎	◎	◎	◎		◎
	20VT-D		◎		12*	8	Transistor	4	◎	◎	◎	◎	◎	◎
Expansion	8ER-A	◎			4	4	Relay							
	8ER-D		◎		4	4	Relay							
	8ET-D		◎		4	4	Transistor							

◎: YES

* : The input points consist of the ones having analog input function.

12-3 Power Supply Standard Discrete Input

.12-3-1 AC/DC 24V

Item	SG2-10HR-A SG2-10KR-A SG2-10CR-A	SG2-20HR-A SG2-20KR-A	SG2-20HR-D SG2-20KR-D SG2-20HT-D SG2-20KT-D	SG2-12HR-D SG2-12KR-D SG2-12CR-D SG2-12HT-D SG2-12KT-D SG2-12CT-D
Operation voltage	AC 100~240V	AC 100~240V	DC 24V	DC 24V
Voltage Range	AC 85~264V	AC 85~264V	DC 20.4~28.8V	DC 20.4~28.8
Operation frequency	50 / 60 Hz	50 / 60 Hz		
Frequency limits	47～63Hz	47～63Hz		
Momentary interrupt	10 ms(half period) / 20 times (IEC	10 ms(half period) / 20 times (IEC	1ms/10times (IEC 61131-2)	10ms/10times(IEC 61131-2)

immunity	61131-2)		61131-2)					
protection	External by 1A Fuse or circuit breaker		External by 1A Fuse or circuit breaker		External by 1A Fuse or circuit breaker		External by 1A Fuse or circuit breaker	
Isolation	None		None		None		None	
Average current consumption	AC 110V	AC 220V	AC 110V	AC 220V	DC 24V	DC 28.8V	DC 24V	DC 28.8V
	all Inputs & relays **ON** 90mA	all Inputs & relays **ON** 90mA	all Inputs & relays **ON** 83mA	all Inputs & relays **ON** 78mA	All Inputs & relays **ON** 130 mA	All Inputs & relays **ON** 148 mA	All Inputs & relays **ON** 79mA	All Inputs & relays **ON** 86 mA
	all Inputs & relays **OFF** 85mA	all Inputs & relays **OFF** 85mA	all Inputs & relays **OFF** 27mA	all Inputs & relays **OFF** 16mA	All Inputs & relays **OFF** 29.4mA	All Inputs & relays **OFF** 31.2mA	All Inputs & relays **OFF** 26mA	All Inputs & relays **OFF** 23mA
Power dissipation	typ. 3.2 W		12 W		3.1 W		2W	

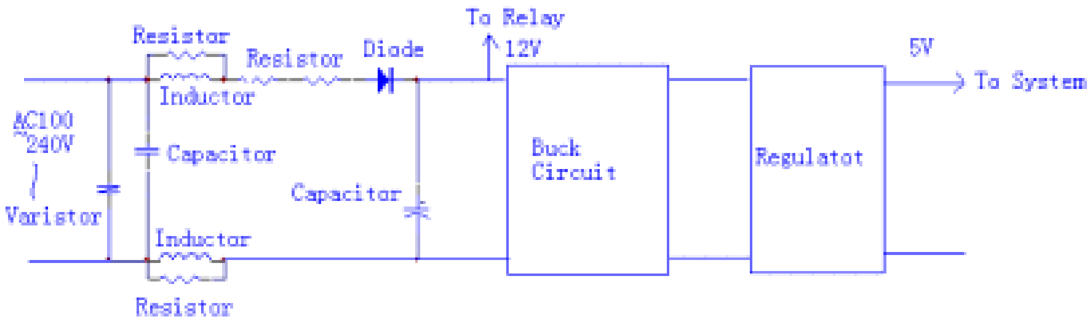
12-3-2 DC 12V

Item	**SG2-12HR-12D**		**SG2-20HR-12D**	
Operation Voltage	DC 12 V		DC 12 V	
Voltage range	DC 10.4~14.4 V		DC 10.4~14.4 V	
Momentary interrupt immunity	10 ms / 10 times (IEC 61131-2)		1ms/ 10 times (IEC 61131-2)	
protection	External by 1A Fuse or circuit breaker		External by 1A Fuse or circuit breaker	
Isolation	None		None	
Average current consumption	DC 12V	DC 14.4V	DC 12V	DC 14.4V
	all Inputs & relays **ON** 150mA	all Inputs & relays **ON** 155mA	all Inputs & relays **ON** 220mA	all Inputs & relays **ON** 240mA

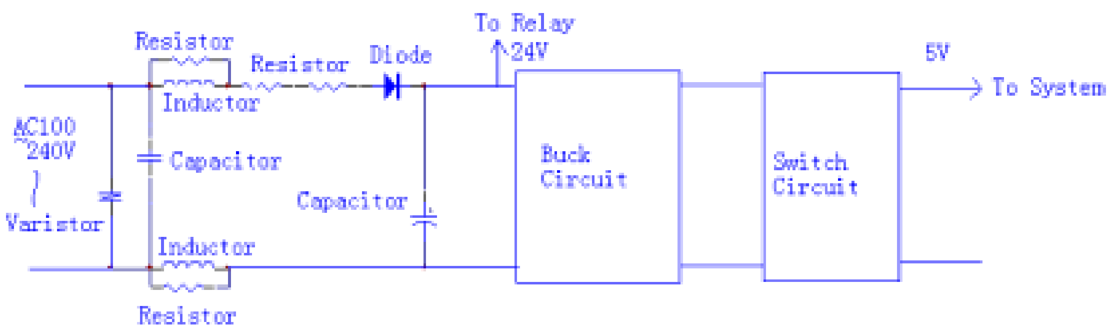
	all Inputs & relays **OFF** 50mA	all Inputs & relays **OFF** 45mA	all Inputs & relays **OFF** 55mA	all Inputs & relays **OFF** 45mA
Power dissipation	2W		3.1 W	

12-3-3 Power supply input wiring sketch:

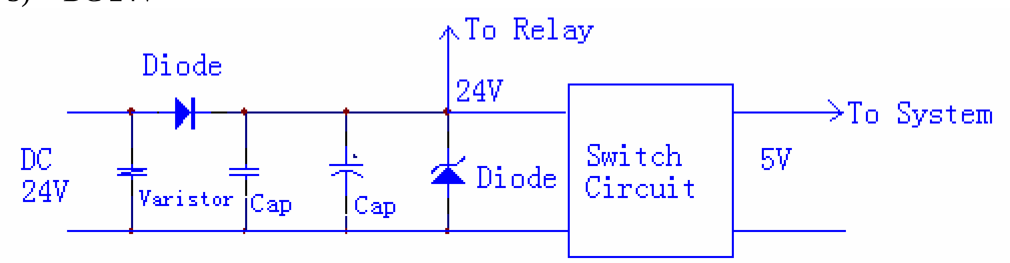
1) AC 10 Point



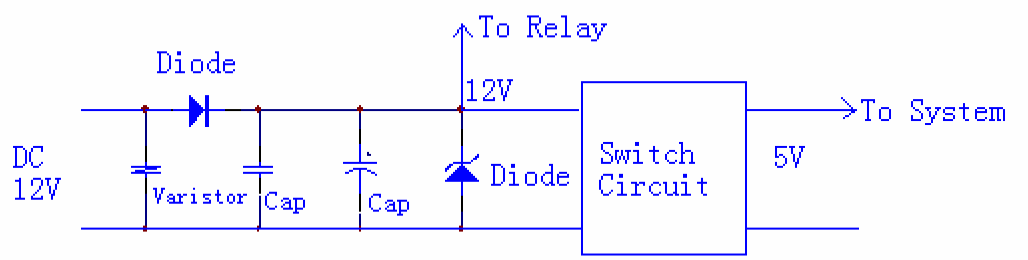
2) AC 20 Point



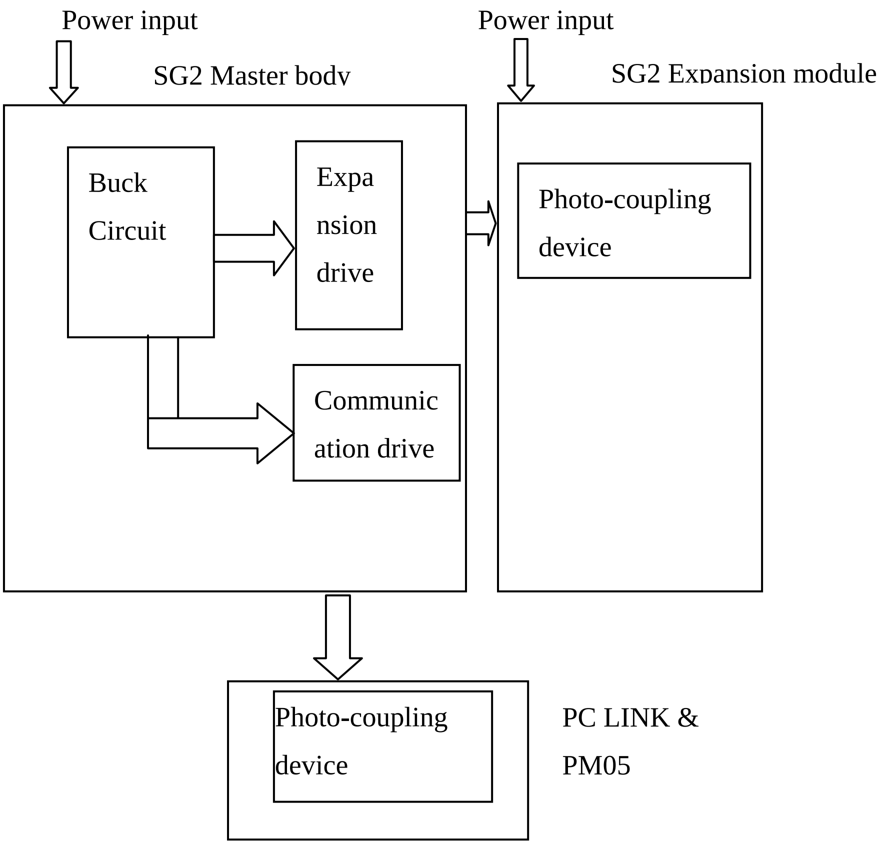
3) DC 24V



4) DC 12V

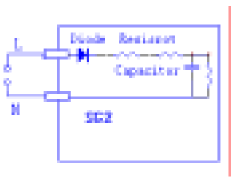


.Master, Expansion module and communication



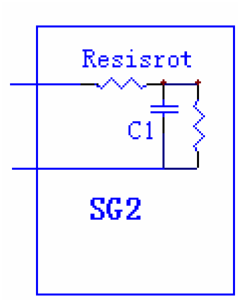
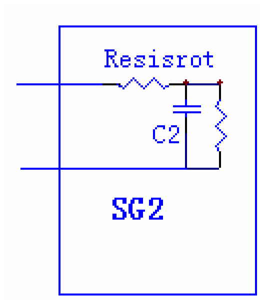
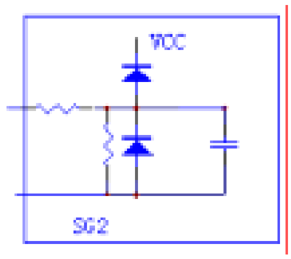
12-4 Standard Discrete Inputs

12-4-1 AC type

Item	**SG2-10HR-A** **SG2-10KR-A** **SG2-10CR-A**		**SG2-20HR-A** **SG2-20KR-A**	
Input circuit				
Quantity	6		12	
Current	AC 110V 0.66 mA	AC 220V 1,3 mA	AC 110V 0.55mA	AC 220V 1.2 mA
ON State	＞ AC 79 V /0.41mA		＞ AC 79 V/ 0.4mA	
OFF State	＜ AC 40 V /0.28 mA		＜ AC 40 V / 0.15mA	
Maximal Cable Length	＜ / = 100 m		＜ / = 100 m	
Response time	On= > Off		On= > Off	
	Typical 50/60 Hz 50/45 ms(AC 110 V)		Typical 50/60 Hz 50/45 ms(AC 110 V)	

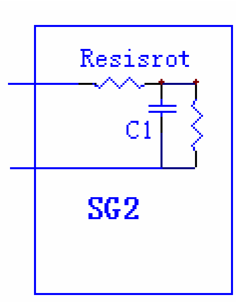
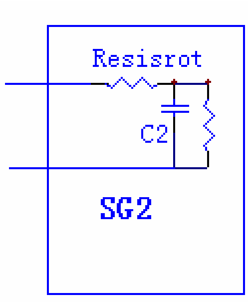
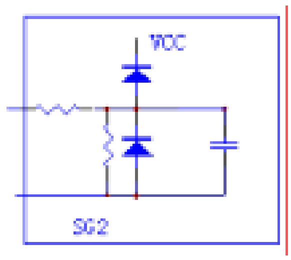
	Typical 50/60 Hz 90/85 ms(AC 220 V)	Typical 50/60 Hz 90/85 ms(AC 220 V)
	Off= > On	Off= > On
	Typical 50/60 Hz 50/45 ms(AC 110 V)	Typical 50/60 Hz 50/45 ms(AC 110 V)
	Typical 50/60 Hz 22/18 ms(AC 220 V)	Typical 50/60 Hz 22/18 ms(AC 220 V)

12-4-2 24V DC type12 I/O

Item	**SG2-12HR-D& SG2-12KR-D & SG2-12CR-D SG2-12HT-D&SG2-12KT-D&SG2-12CT-D**			
	Standard Discrete Input	**High Speed Input**	**Analog input as discrete input**	**Analog input**
Input circuit	I3~I6 	I1,I2 	I7,I8 	
Quantity	4	2	2	2
Current	3.2mA/24V DC	3.2mA/24V DC	0.63mA/24V	< 0.17 mA/10V
ON State	> 1.875mA/15V	> 1.875mA/15V	> 0.161mA/9.8V	
OFF State	< 0.625mA/5V	< 0.625mA/5V	< 0.085mA/5V	
Maximal Cable Length	< / = 100 m	< / = 100 m	< / = 100 m	< / = 30 m(shielded)
Response time	On= > Off	On= > Off	On= > Off	
	3ms	0.3ms	Typical: 5ms	
	Off= > On	Off= > On	Off= > On	
	5ms	0.5ms	Typical: 3ms	
Type				0~10 V DC
Display Resolution				0.01V DC
Conversion				10

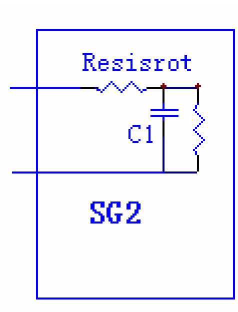
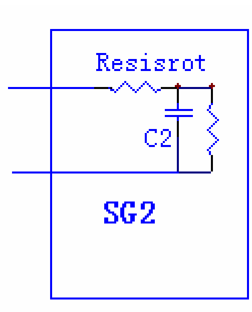
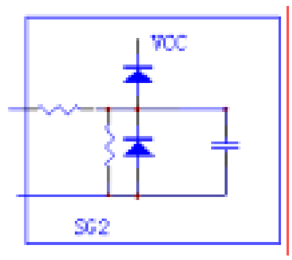
Versus true value				±2%±0.12V
Conversion time				
Sensor impedance				< 1K ohm

12-4-3 24 DC type 20 I/O

Item	**SG2-20HR-D& SG2-20KR-D** **SG2-20HT-D& SG2-20KT-D**			
	Standard Discrete Input	**High Speed Input**	**Analog input as discrete input**	**Analog input**
Input circuit	I3~I8 	I1,I2 	I9,IA,IB,IC 	
Quantity	6	2	4	4
Current	3.1mA/24V DC	3.1mA/24V DC	0.63mA/24V	< 0.17 mA/10V
ON State	> 1.875mA/15V	> 1.875mA/15V	> 0.163mA/9.8V	
OFF State	< 0.625mA/5V	< 0.625mA/5V	< 0.083mA/5V	
Maximal Cable Length	100 m	100 m	100 m	30m (shielded)
Response time	On= > Off	On= > Off	On= > Off	
	5ms	0.5ms	Typical: 5ms	
	Off= > On	Off= > On	Off= > On	
	3ms	0.3ms	Typical: 3ms	
Type				0~10 V DC
Display Resolution				0.01V DC
Conversion				10
Versus true value				±2%±0.12V

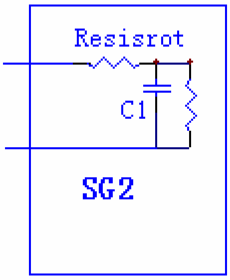
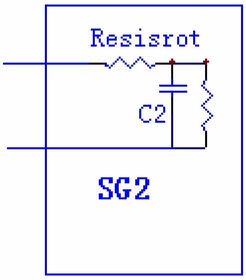
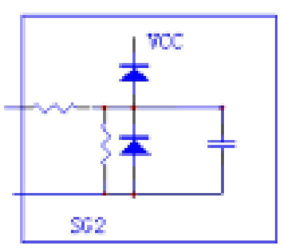
Conversion time				
Sensor impedance				< 1K ohm

12-4-4 12 DC Type 12 I/O

Item	SG2-12HR-12D			
	Standard Discrete Input	**High Speed Input**	**Analog input as discrete input**	**Analog input**
Input circuit	I3~I6 	I1,I2 	I7,I8 	
Quantity	4	2	2	2
Current	3.2mA/12V DC	3.2mA/12V DC	0.32mA/12V	< 0.17 mA/10V
ON State	> 1.875mA/7.5V	> 1.875mA/7.5V	> 0.161mA/9.8V	
OFF State	< 0.625mA/2.5V	< 0.625mA/2.5V	< 0.085mA/5V	
Maximal Cable Length	< / = 100 m	< / = 100 m	< / = 100 m	< / = 30 m(shielded)
Response time	On= > Off	On= > Off	On= > Off	
	3ms	0.3ms	Typical: 5ms	
	Off= > On	Off= > On	Off= > On	
	5ms	0.5ms	Typical: 3ms	
Type				0~10 V DC
Display Resolution				0.01V DC
Conversion				10
Versus true value				±2%±0.12V

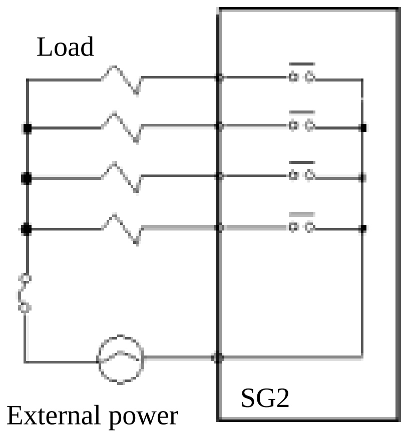
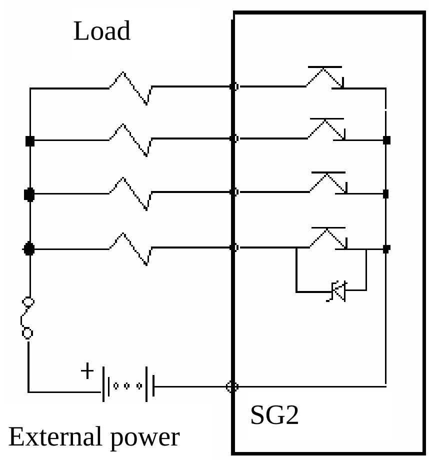
Conversion time				
Sensor impedance				< 1K ohm

12-4-5 12 DC Type 20 I/O

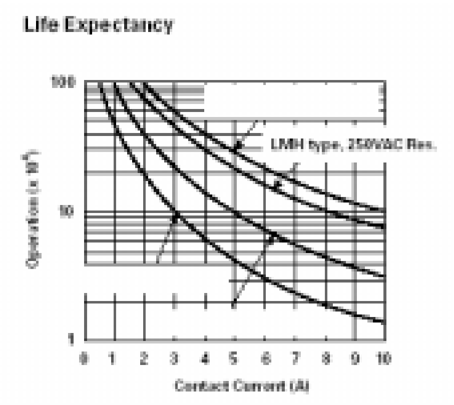
Item	**SG2-20HR-12D**			
	Standard Discrete Input	**High Speed Input**	**Analog input as discrete input**	**Analog input**
Input circuit	I3~I8 	I1,I2 	I9,IA,IB,IC 	
Quantity	6	2	4	4
Current	3.2mA/12V DC	3.2mA/12V DC	0.63mA/12V	< 0.17 mA/10V
ON State	> 1.875mA/7.5V	> 1.875mA/7.5V	> 0.163mA/9.8V	
OFF State	< 0.625mA/2.55V	< 0.625mA/2.55V	< 0.083mA/5V	
Maximal Cable Length	< / = 100 m	< / = 100 m	< / = 100 m	< / = 30m(shielded)
Response time	On= > Off	On= > Off	On= > Off	
	5ms	0.5ms	Typical: 5ms	
	Off= > On	Off= > On	Off= > On	
	3ms	0.3ms	Typical: 3ms	
Type				0~10 V DC
Display Resolution				0.01V DC
Conversion				10
Versus true value				±2%±0.12V
Conversion time				

Sensor impedance				< 1K ohm

12-5 Output Specification

Item		Relay output	Transistor output
Output circuit			
External power		AC240V ,DC 24V 265, 30	
Circuit insulation		Mechanical insulation	Photo-coupling insulation
Max. Load	Resistance load	8A/point	0.3A/point
	Inductance load	—	—
	Light load	200W	10W/DC 24V
Open circuit leak current		—	< 10uA
Min, Load		—	—
Responsive time	OFF⟶ON	5 ms	25 us
	ON ⟶OFF	9 ms	< 0.6 ms

Relay Lifespan



Note 1: The values illustrated in the above graph are standard ones. The service life of the relay will be adversely affected by the ambient temperature.

Note 2: When the current is kept less than 2A, the service life of the relay is about 100,000 times.

Power Supply Module

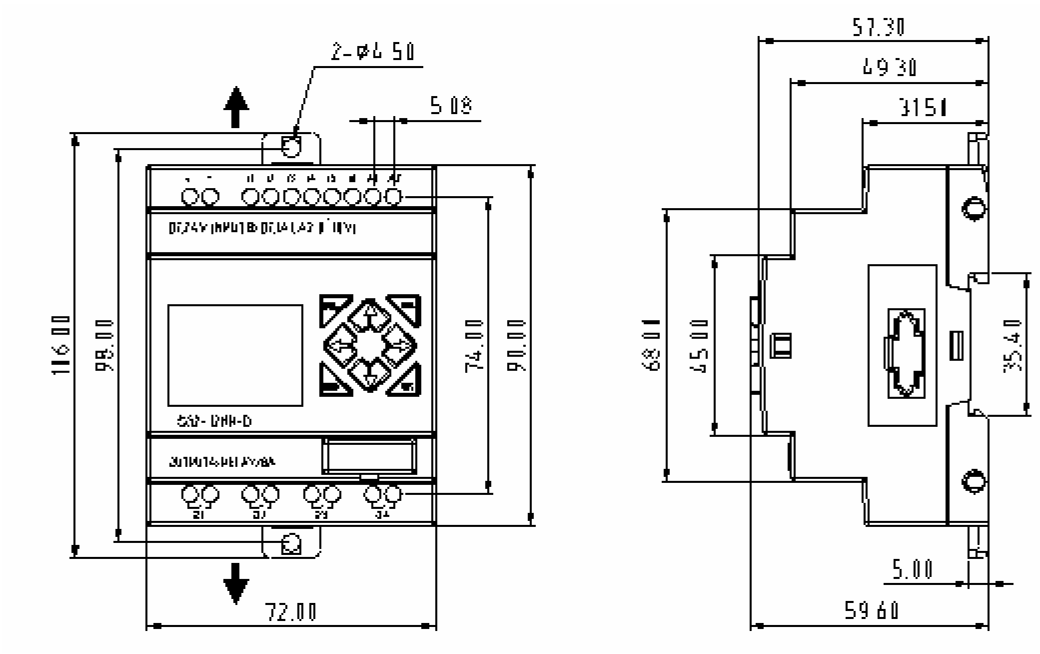
Module	Input/Output
DC + 12V	AC 100-240V / DC + 12V
DC + 24V	AC 100-240V / DC + 24V

Optional Devices

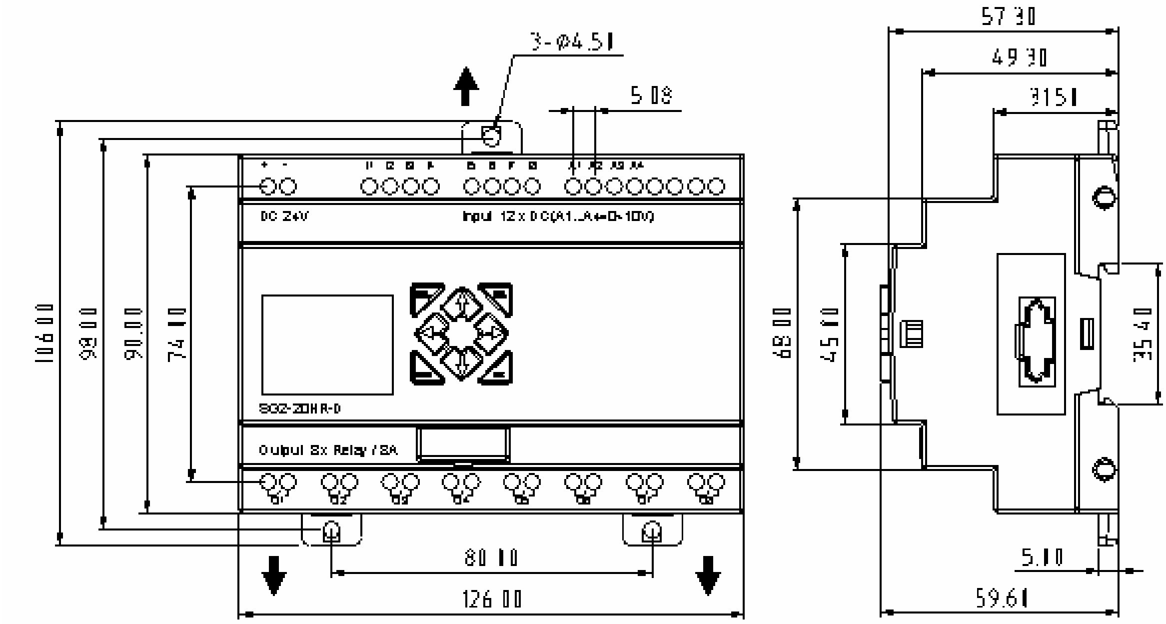
MODE	**Description**
PM05	Spare Program Cartridge
Client	Computer Edition Software

12-3 Dimension Diagram

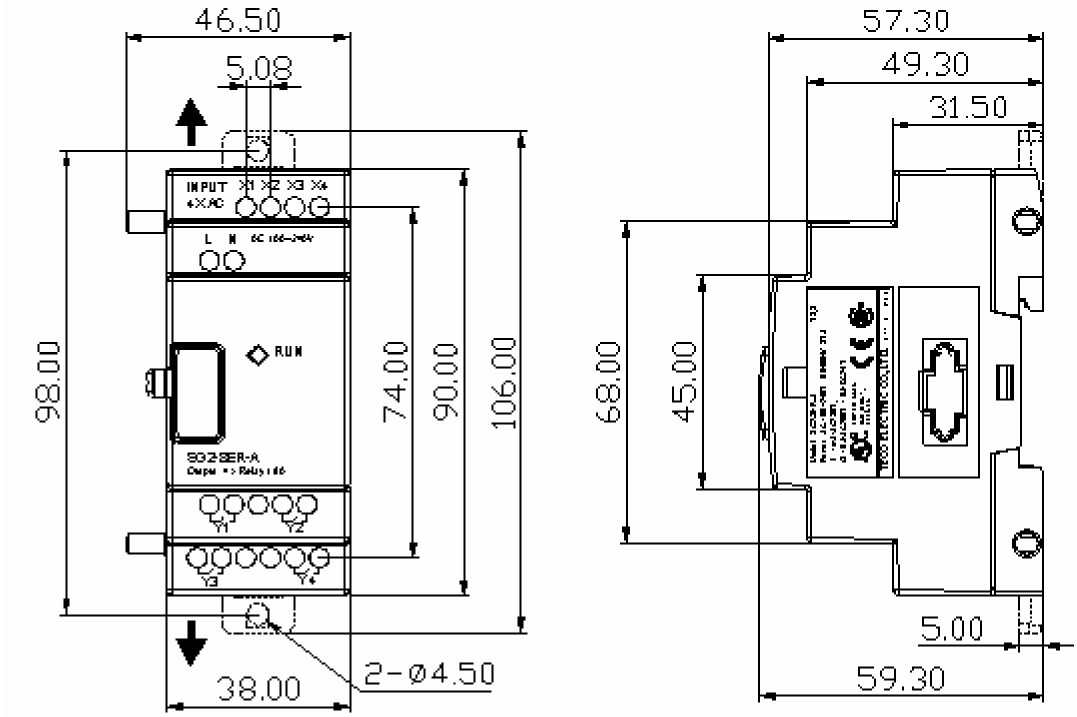
◎ 10/12 points



◎ 20 points



◎ Expansion 8 points


46.50
5.08
57.30
49.30
31.50
INPUT
X1 X2 X3 X4
L N
RUN
98.00
74.00
90.00
106.00
68.00
45.00
Y1 Y2
Y3 Y4
5.00
2-Ø4.50
38.00
59.30

Chapter 13　　20 points V TYPE Function

V TYPE Function is only For SG2-20VR-D, SG2-20VT-D

1　Function Summarize：

1.1　Remote IO Function：Master-Slaver communication；

1.2　IO Link Function；

1.3　Modbus Slaver Station Function；

2　Function Detail

2.1　Remote IO Function：Master-Slaver communication；

2.1.1　Function Describe：

SG2 Slaver's Input（coil I）and Output（coil Q）can be used as SG2 Master's expansive Input（coil X）and Output（coil Y）；

I/O address	Master station	Slave station
Input coil	I1~IC	
Output coil	Q1~Q8	
Expand input coil	X1~XC	I1~IC
Expand output coil	Y1~YC	Q1~Q8

2.1.2　System Setting：

2.1.2.1　Connected A and B lines of two V-type SG2，as Figure1；

2.1.2.2　Setting M（Master）for the instance of first SG2's menu SET-- REMOTE I/O；

2.1.2.3　Setting S（Slaver）for the instance of second SG2's menu SET-- REMOTE I/O　；

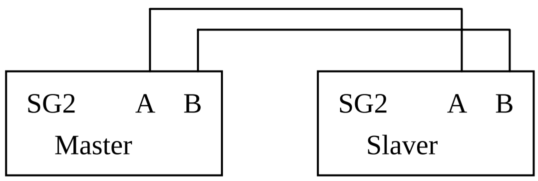


Figure1：Master-Slaver communication connection

2.1.3　Example：

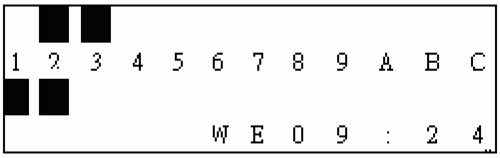
2.1.3.1　Programming in SG2 Ladder on SG2 Master as follows，running the program and observing the states of expended input coils X and output coils Y；

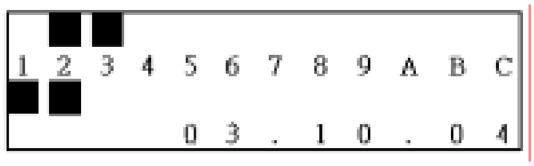
X2———————— Y1

X3———————— Y2

Enable the input coils I2~I3 of SG2 Slaver according to coil X2~X3 on the SG2 Master. When enable I2 on SG2 Slaver, output Q1 and enable I3, output Q2.

When Run，Slaver display the I/O　　　　When Run Master display X/Y





2.2 IO Link Function：

2.2.1 System setting：

2.2.1.1 Connected A and B lines of some (1~8)V-type SG2，as Figure2；

2.2.1.2 Setting N（No Remote IO）for the instance of all SG2's menu SET--REMOTE I/O；

2.2.1.3 Setting 00，01，02，…for the instance of each of SG2's menu SET--ID SET，ID must be a series number(0~7) and maximal is 07；

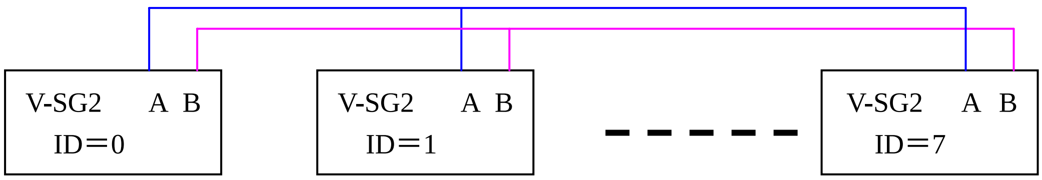
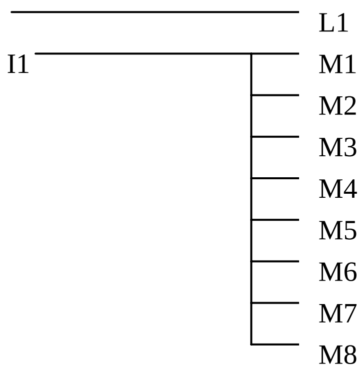


Figure2：IO Link communication connection

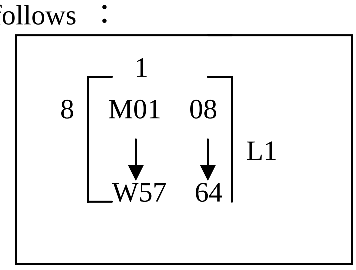
2.2.2 Example：

2.2.2.1 Connected A and B lines of 8 V-type SG2，as Figure2；

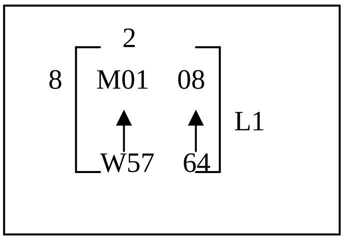
2.2.2.2 Setting 00 ~ 07 for each SG2's ID number，and programming in SG2 Ladder as follows；



2.2.2.3 Programming SG2(ID＝7)，setting function block L1 working mode as follows ：



2.2.2.4 Programming the other SG2(ID= 0~6)，setting function block L1 working mode as follows；



2.2.2.5 Running all SG2's programs，control SG2 (ID＝7)，When coil I1 is d ON，coils M1~M8 is ON；

2.2.2.6 Observing other SG2(ID= 0~6)，the states of coils M1~M8 is changed from the states of coils M1~M8 of SG2(ID= 7)；

2.3 Modbus Slaver Station Function：

2.3.1 Function Describe：

SG2 is a Modbus slaver station，By Modbus communication protocol，it can be read or wrote coils states and the preset value of function blocks，it also can be read the current value of function blocks and can control SG2 to run or stop；

2.3.2 System setting：

2.3.2.1 Connected A and B lines of some V-type SG2 with a Modbus master station，as Figure3；

2.3.2.2 Setting N（No Remote IO）for the instance of all SG2's menu SET--REMOTE I/O；

2.3.2.3 Setting nonzero for the instance of each of SG2's menu SET--ID SET，ID number is 01～99；

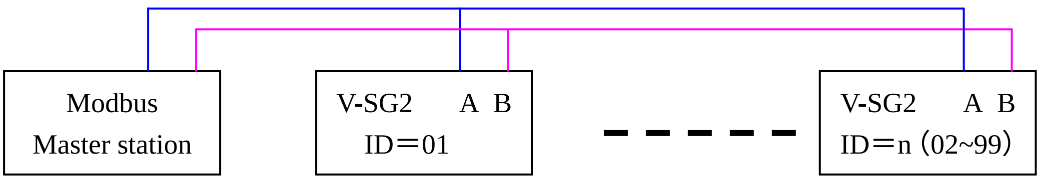


Figure3：Modbus communication connection

Appendix Application Illustration

1. Lighting Control for Staircase

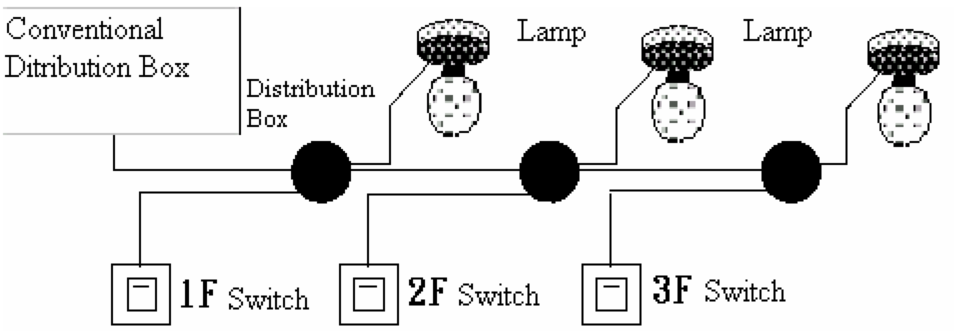
1.1 Requirement for Staircase Lighting

- When someone goes up-stair or down-stair, the lighting system shall be energized to provide sufficient luminance.
- After the walker passes the staircase, lighting system shall be turned off in five minutes automatically or manually.

1.2 **Traditional Lighting Control**

There are two traditional controls available:

- Apply pulse relay
- Apply automatic timer to control the lighting system on the staircase



Components Applied

- Switches
- Auto lighting system or pulse relay for staircase

Applying the pulse relay as controller for staircase lighting system

- The lighting is on as long as any switch is turned on.
- Press any switch again to turn off the lighting system.

Shortcoming: It is a frequent weak point for the person to forget turning off the light at most cases.

Auto lighting control system for the staircase

- The light is on whenever the switch is turned on.
- Lighting system shall be turned off in a few minutes automatically or manually

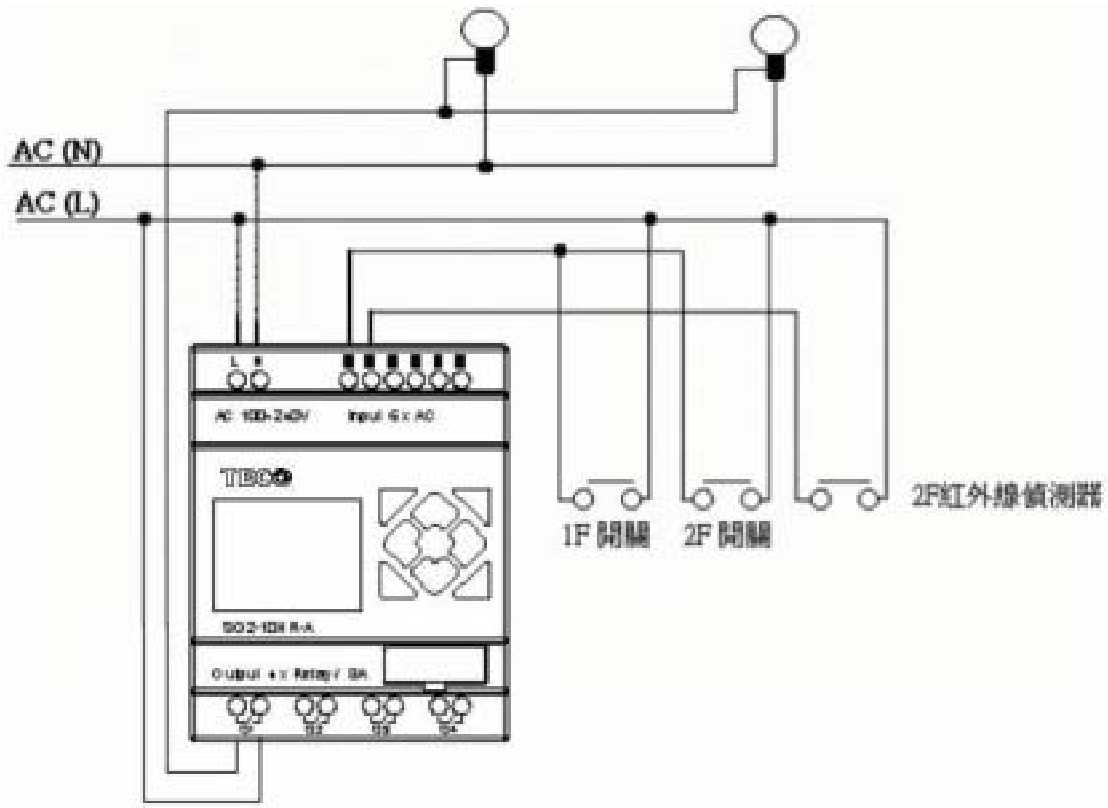
Shortcoming: The user has no way to reset the turn-off time.

1.3 Apply SG2 in Lighting System

Devices Applied

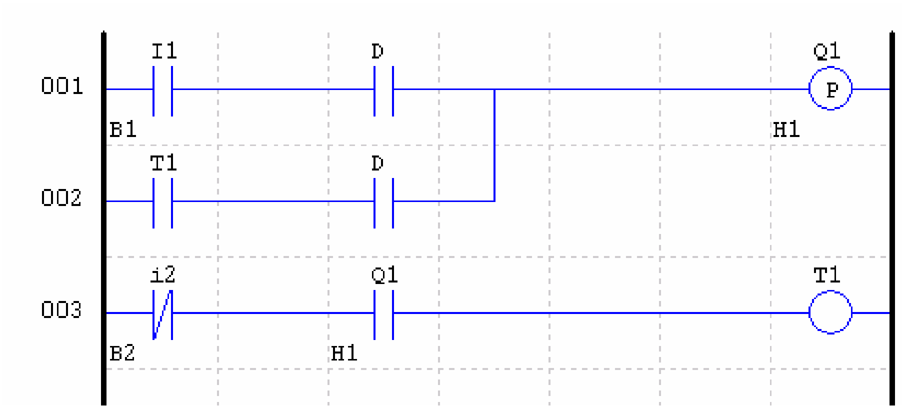
- Q1 Lamp H1
- I1(No terminal) Switch B1
- I2(No terminal) Infrared sensor for climbing

Wiring Diagram for Lighting System

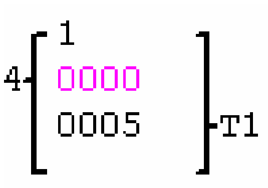


Illustrated program using SG2 in lighting system

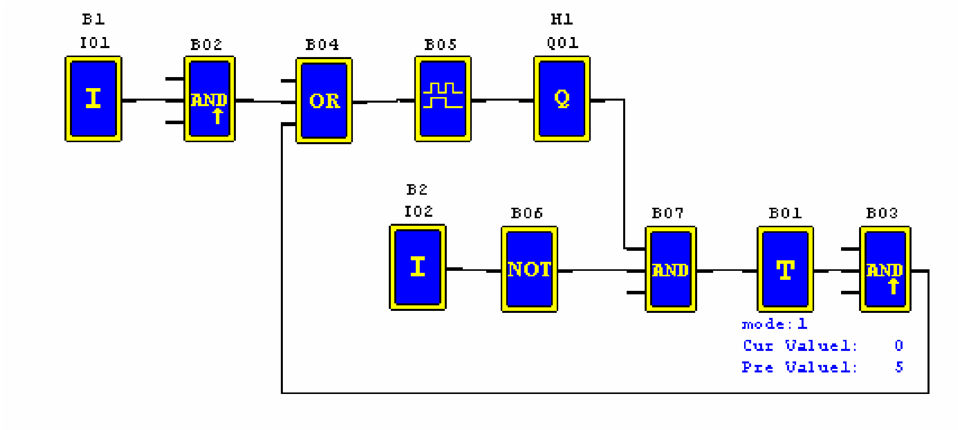
Ladder：



FUNCTION：



FBD：

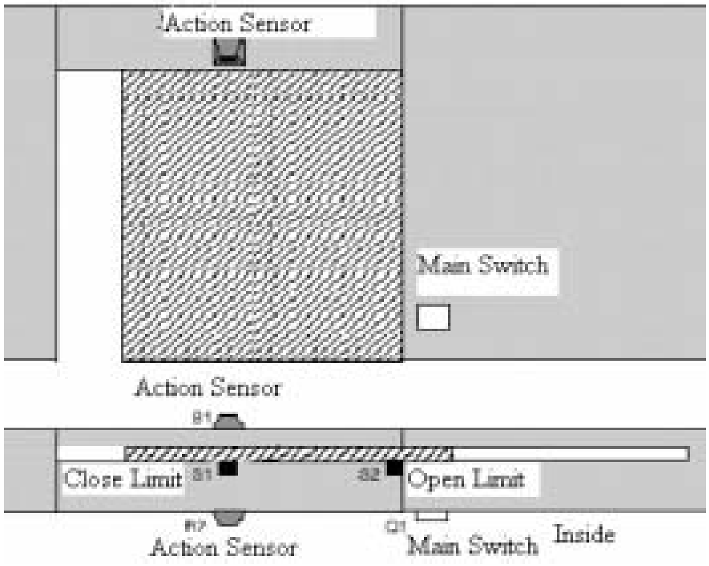


2 Auto Door Control

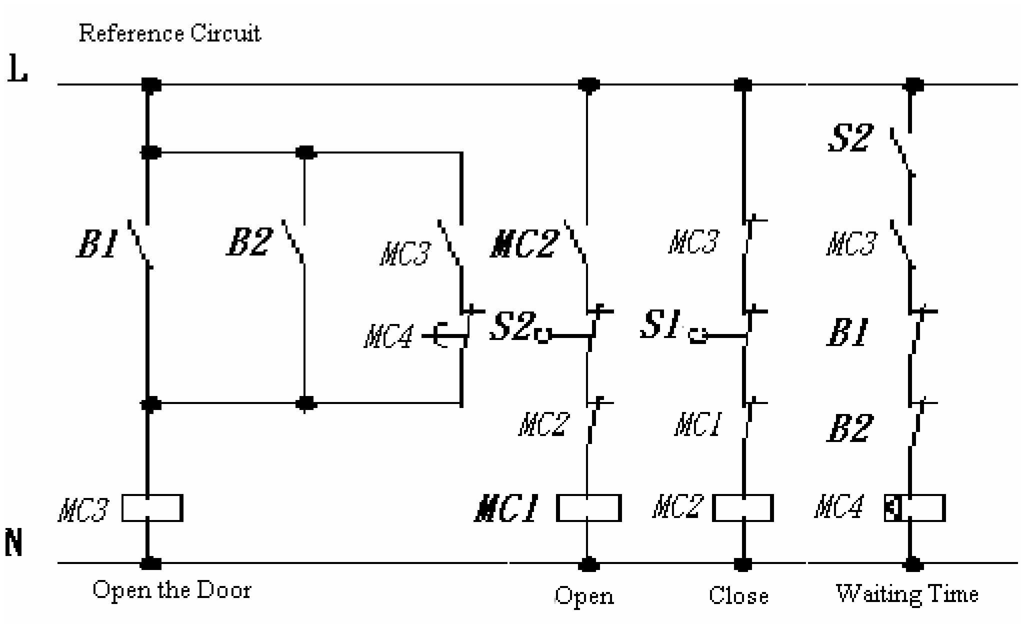
The auto doors are very popularly installed at the entrance of supermarkets, mansions, banks and hospitals.

2.1Requirement for Auto Door Control

- It automatically opens whenever a person is approaching.
- The door remains open for a certain period and closes if no visitor is present.



2.2 Traditional solution



Whenever B1 or B 2 senses the approach of a visitor, the door is actuated to open. After an elapse of time, B1 or B2 senses no presence of a visitor;   MC 4 will close the door.

2.3 Apply SG2 in Door Control System

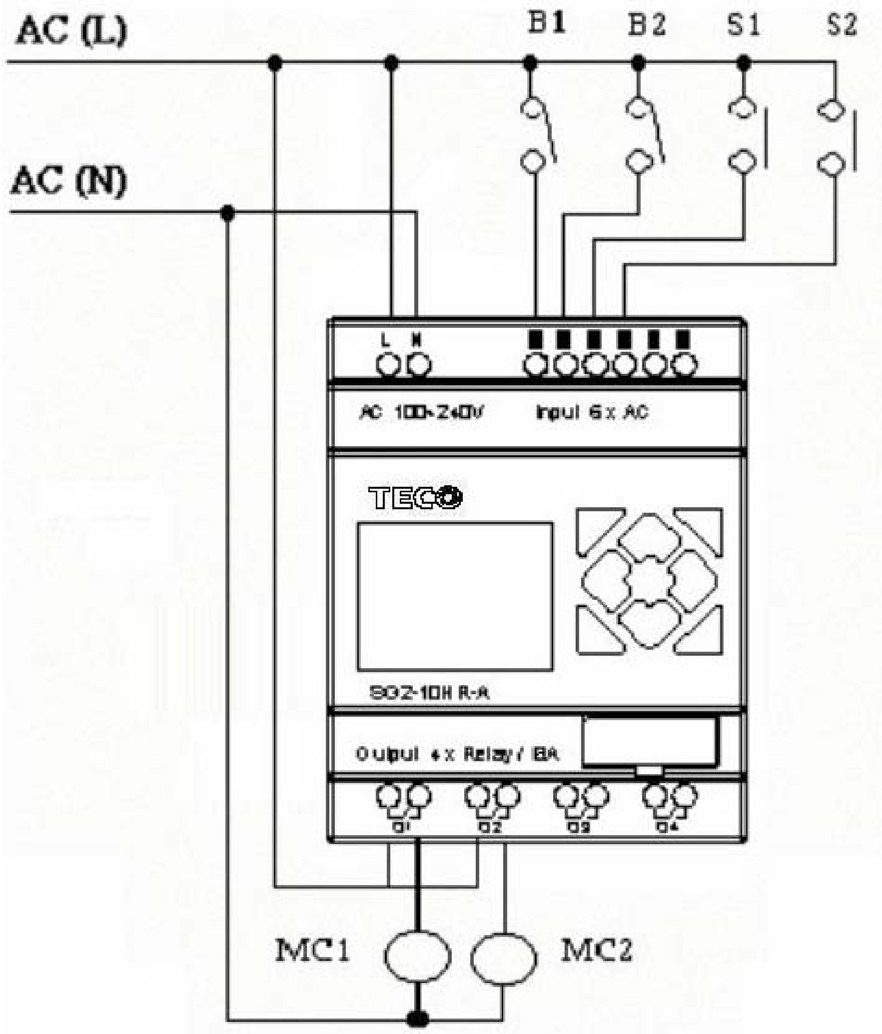
Applying SG2 in door control system can simplify the circuit. All that one need to do is connect the action sensor, limit switch and contactor with SG2.

Devices Applied

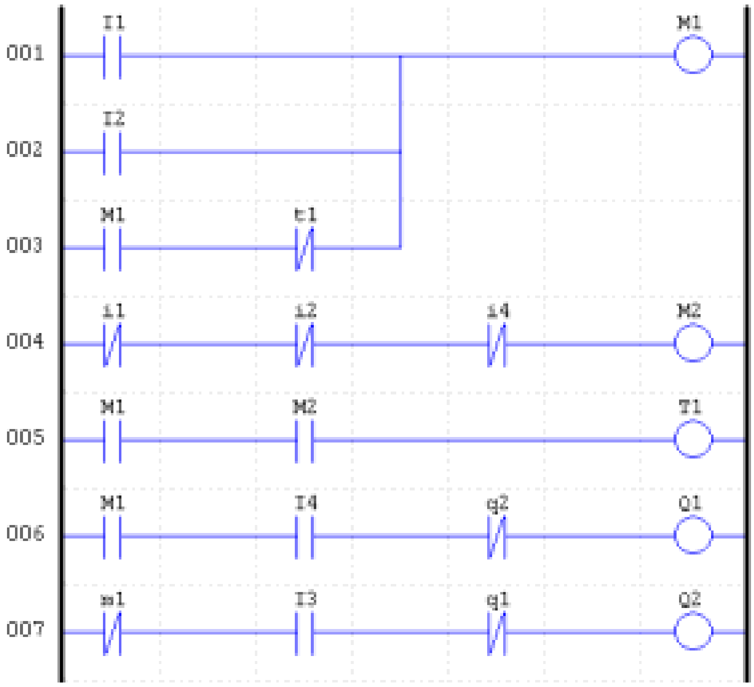
- MC1 main door open contactor
- MC2 main door close contactor

- S1(NC contact) closing limit switch
- S2(NC contact) opening limit switch
- B1(NO contact) outdoor infrared sensor
- B2(NO contact) indoor infrared sensor

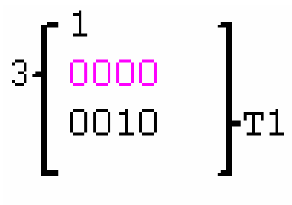
Wiring Diagram and Program with SG2 applied in door control system.



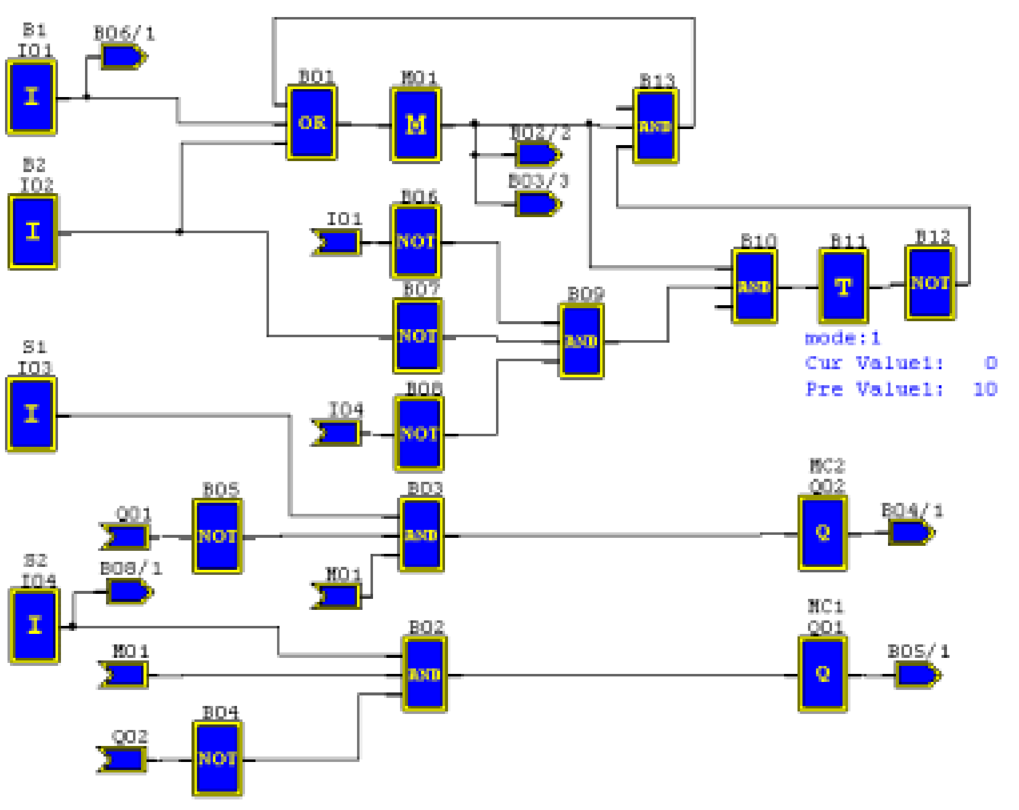
Ladder：



FUNCTION：



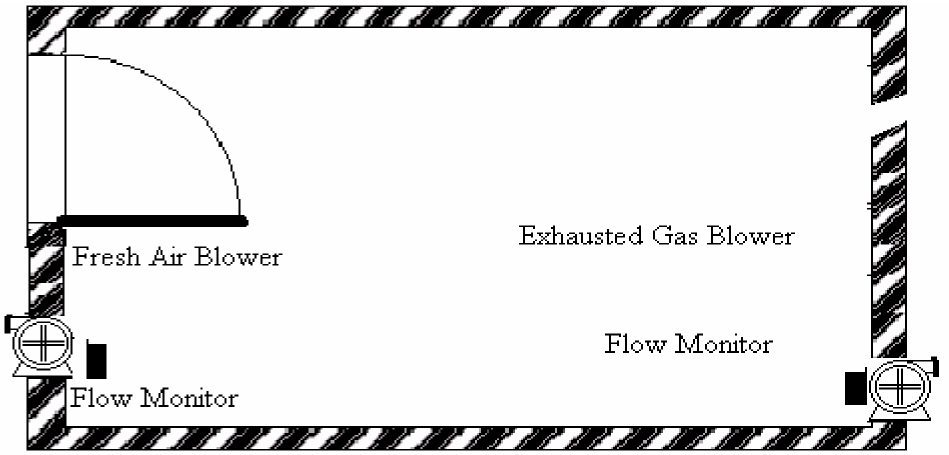
FBD Operation Flow：


B1
I01
B06/1
B01
OR
M01
M
B13
AND
B02/2
B03/3
B2
I02
I01
B06
NOT
B10
AND
B11
T
B12
NOT
B07
NOT
B09
AND
mode:1
Cur Value1: 0
Pre Value1: 10
S1
I03
I04
B08
NOT
Q01
B05
NOT
B03
AND
MC2
Q02
Q
B04/1
S2
I04
B08/1
M01
M01
B02
AND
MC1
Q01
Q
B05/1
Q02
B04
NOT

3. **Ventilation Control**

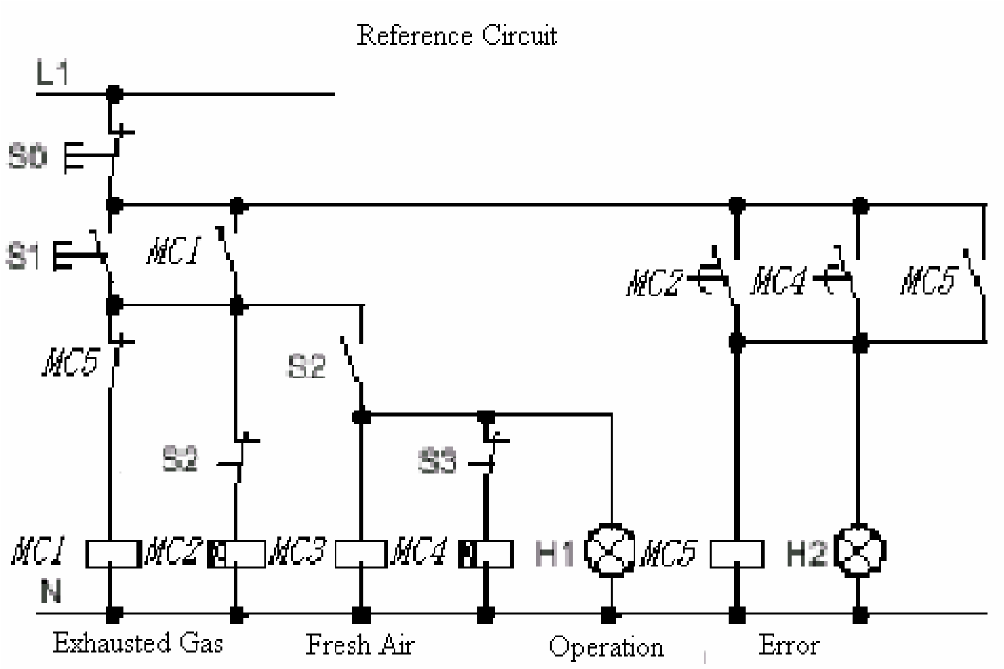
3.1 Ventilation System Requirement

The main function of the ventilation system is to blow in the fresh air and blow out the waste air as shown in the below drawing



- The room is provided with exhausted gas blower and fresh air blower
- The flow sensor control the blowing in and out operation
- Over pressure is permitted at no time.
- The fresh blower will run only if the flow monitor senses that the exhausted gas blower works properly.
- If any irregularity takes place on air in blower and air out blower, the warning lamp will light.

The control circuit for the traditional ventilation system is shown below:

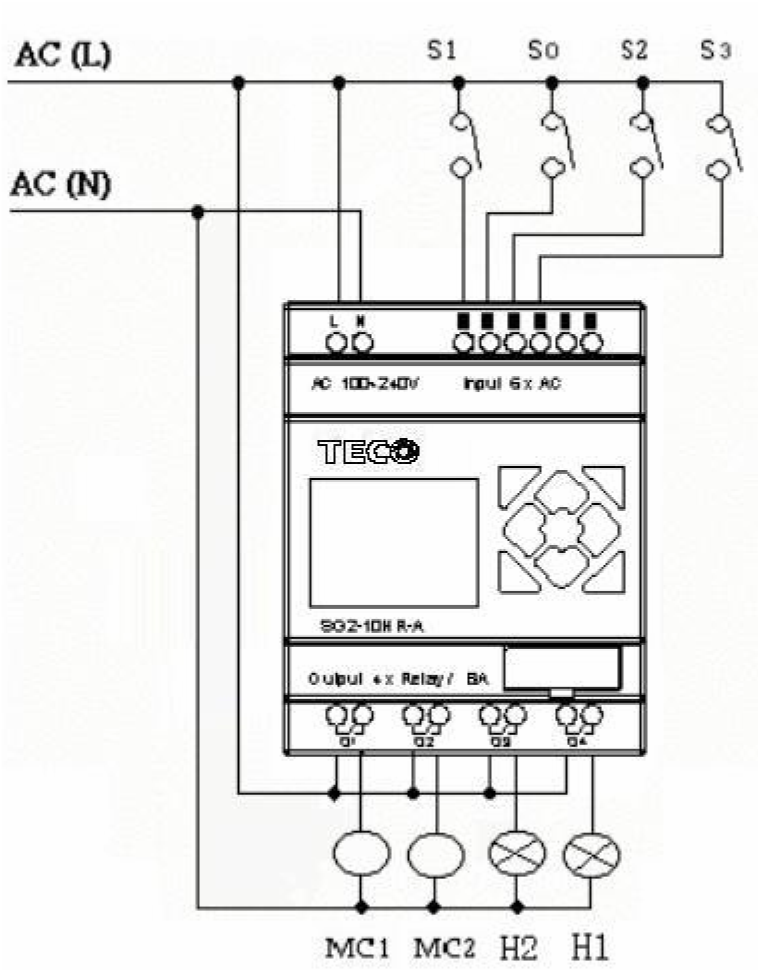


The ventilation system is wholly controlled by the airflow monitor. If there is no flow air in the room after a designated duration of time, the system will activate the warning system so the user shall shut off the system.

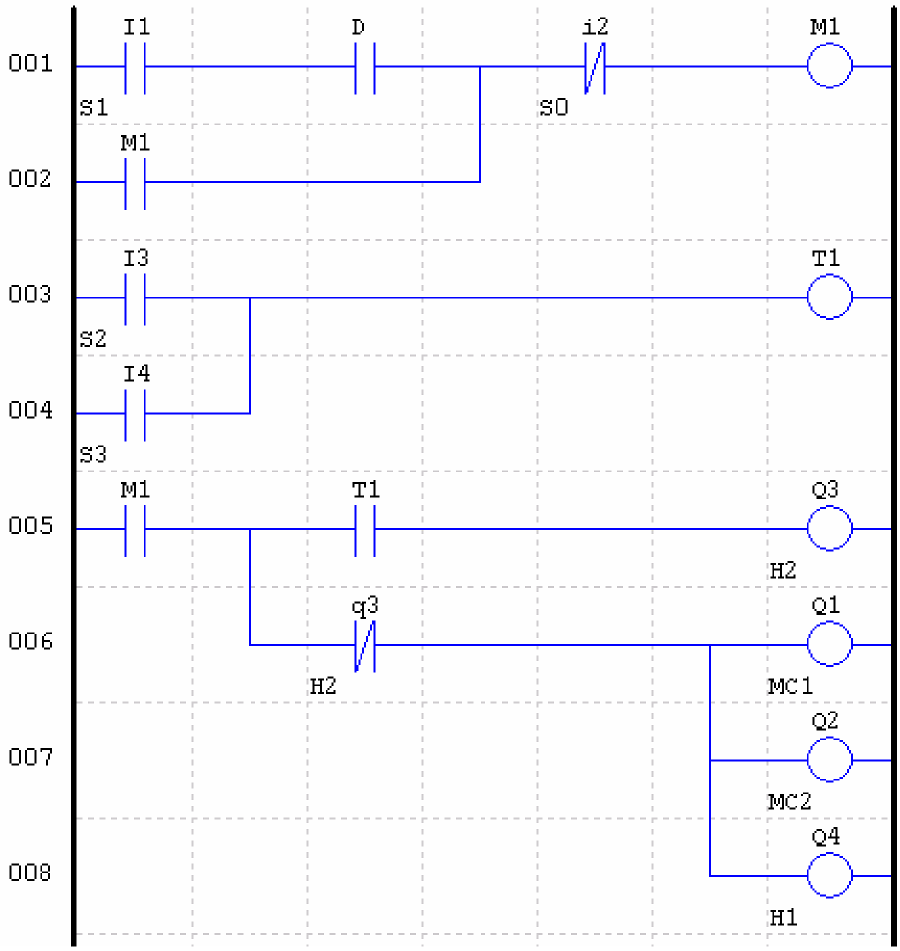
Devices Applied

- MC1 main contactor
- MC2 main contactor
- S0(NC contact) stop switch
- S1(NO contact) start switch
- S2(NO contact) air flow monitor
- S3(NO contact) air flow monitor
- H1operation indicator
- H2 alarm light

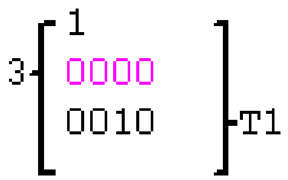
Wiring Diagram and Program with SG2 applied in Ventilation System.


AC (L)
AC (N)
S1
S0
S2
S3
L N
AC 100~240V
Input 6 x AC
TECO
SG2-10H R-A
Output 4 x Relay / 8A
MC1
MC2
H2
H1

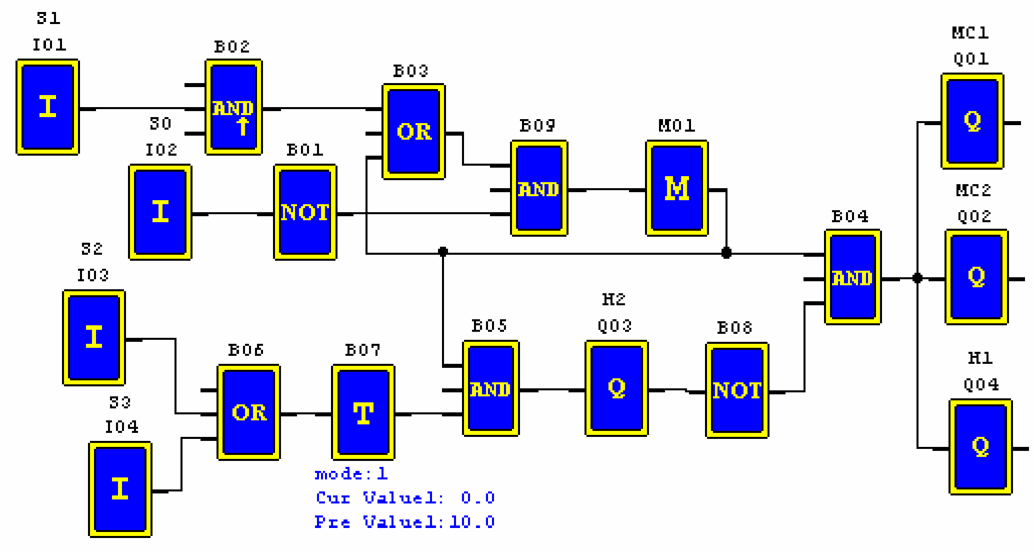
Ladder：



FUNCTION：



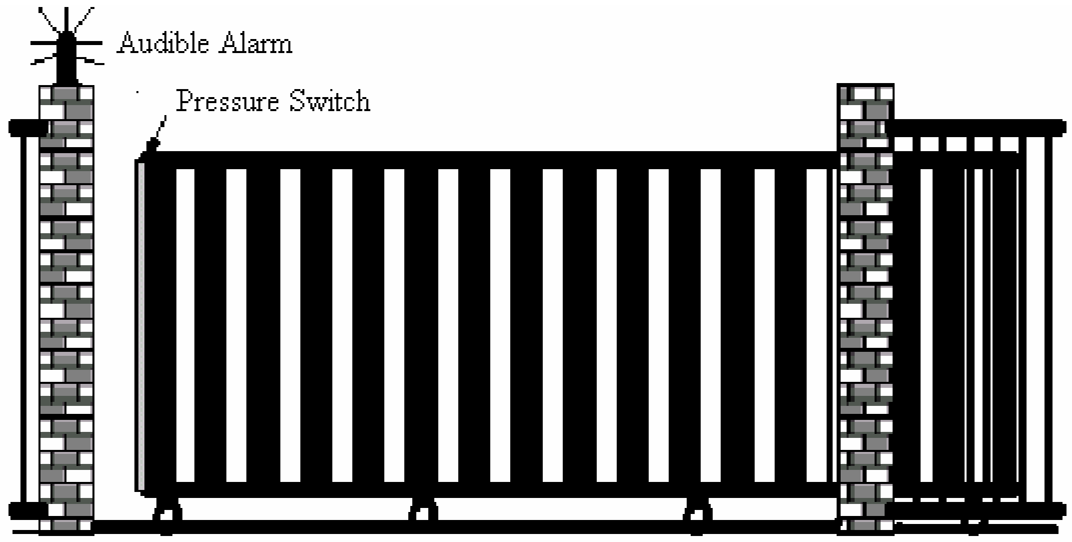
FBD Operation Flow：



4. **Plant Gate Control**

4.1 **Requirements for Plant Gate Control**

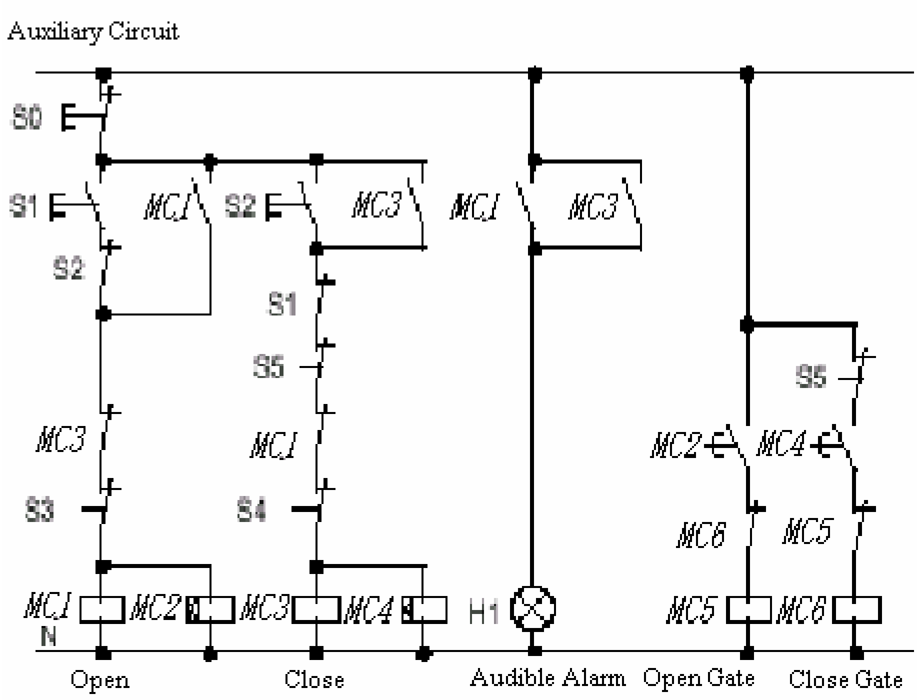
The main purpose of the plant gate is to control the access of truck, which is manually operated by the gate guard.



- The door guard controls and oversees the opening, closing of the plant door gate.
- The stop switch can be activated at any time regardless of the gate in fully open or close condition.
- The alarm light will be activated for 5 seconds in advance before the gate operation.
- The damper is provided on the gate. Gate closing operation, whenever

the damper is contacted by the gate, stops.

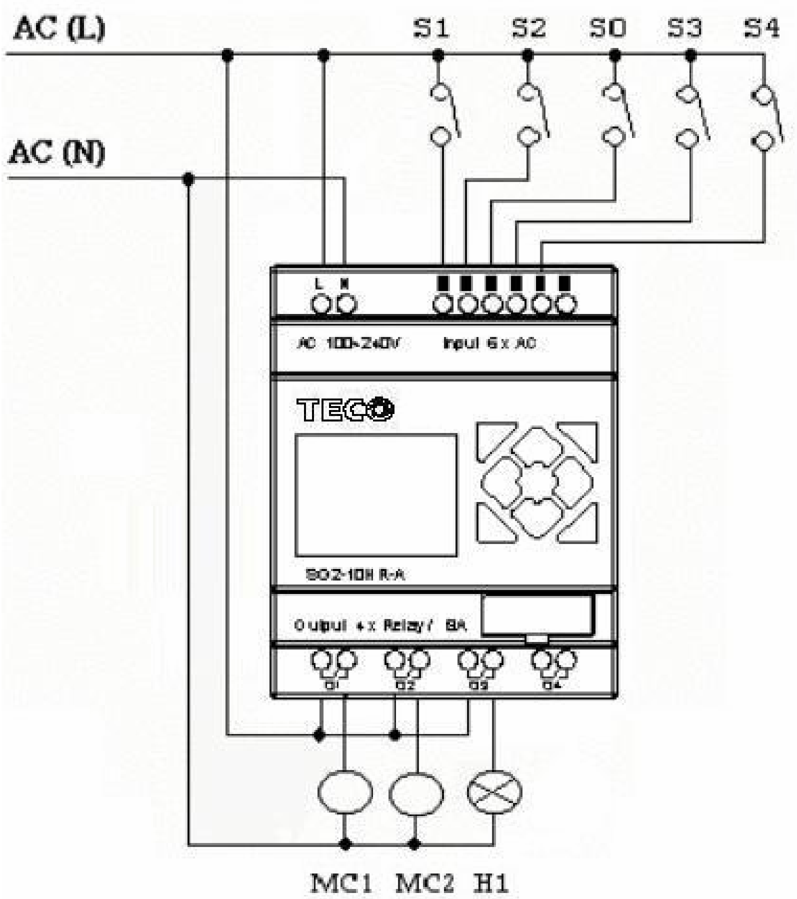
4.2 **Traditional Control Circuit for Gate System**



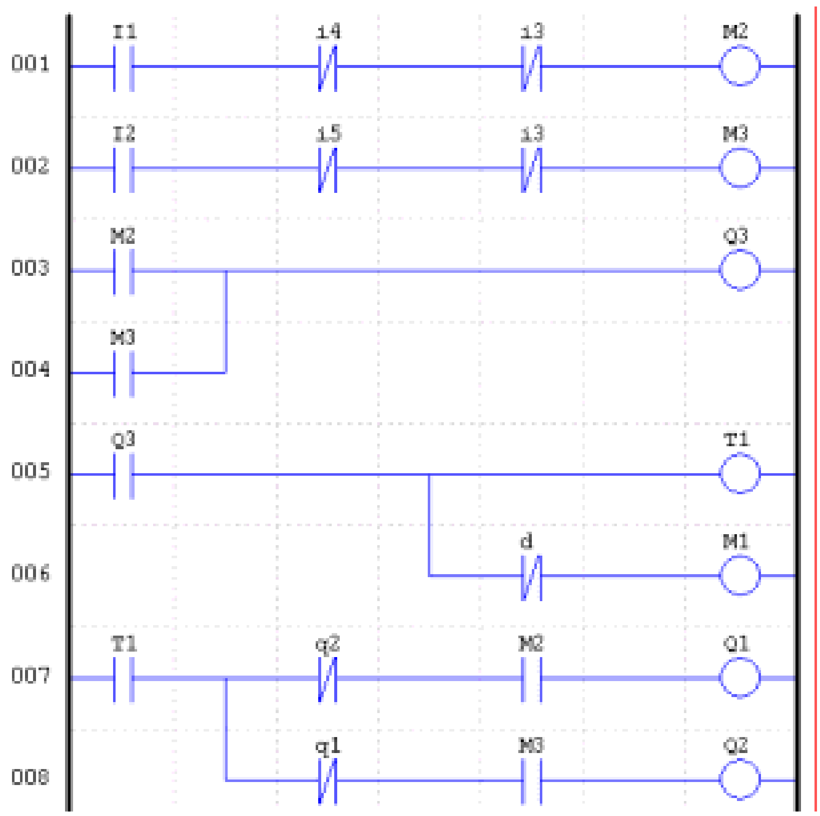
Devices Applied

- MC1 Main Electromagnetic Contactor
- MC2 Main Electromagnetic Contactor
- S0(NC contact) stop switch
- S1(NO contact) open switch
- S2(NO contact) close switch
- S3(NC contact) open safe damper
- S4(NC contact) close safe damper

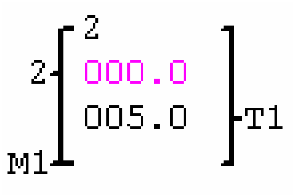
Wiring Diagram and Program with SG2 applied in Plant Gate



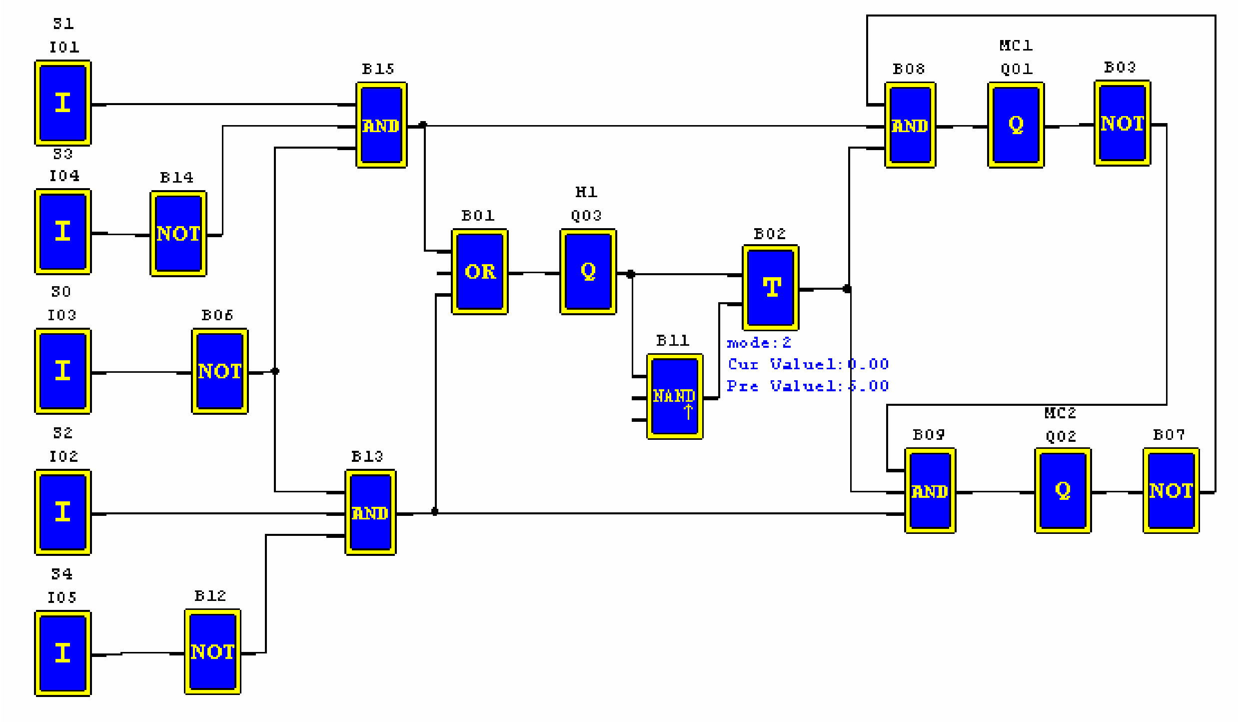
Ladder：



FUNCTION



FBD:



5. Counting Control for Packing Machine

Requirement：

1) The packing cycle is that it begins counting the finished products in the assemble line, when the counting value reaches 12, it proceeds packing operation which takes 5 seconds. After finished, it begins a new cycle.

2) It simultaneous counts the finished packs of product.

3) In case of power failure, the counting remains unchanged.

Analysis：

1) A transducer is employed to produce the pulse signal when the transducer detects the arrival of a product. A counter generates an output when the counting value reaches 12 and a timer is employed to have a delay of five seconds.

2) The counter will be operated in mode 3 or mode 4 in an effort to keep the accurate counting even in case of power failure.

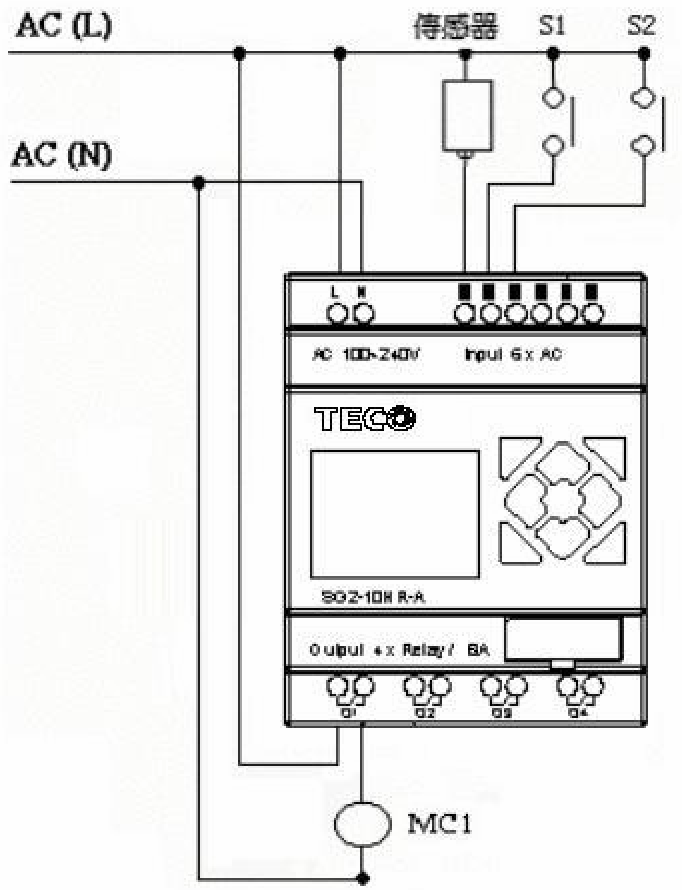
Devices Applied

I1：counting sensor;

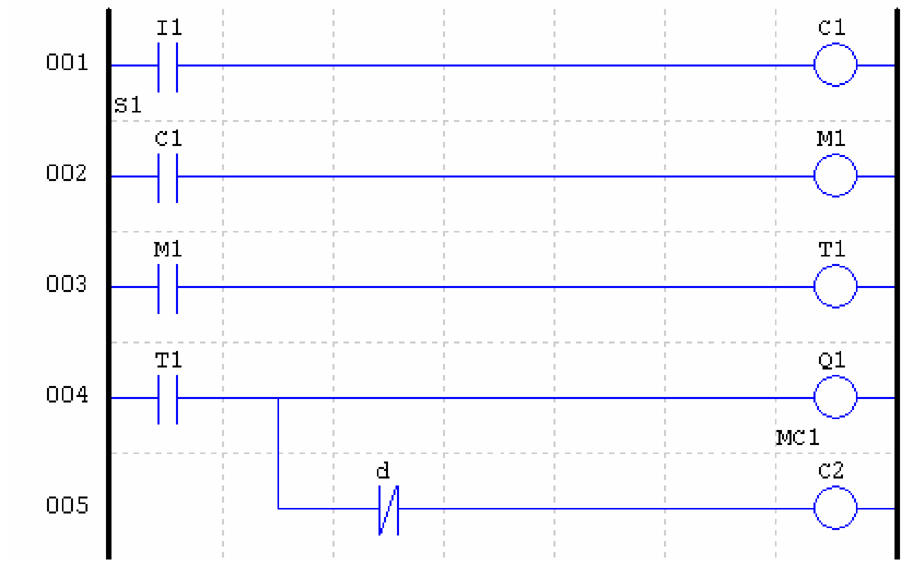
S1：reset the counting value to zero;

MC1：packing

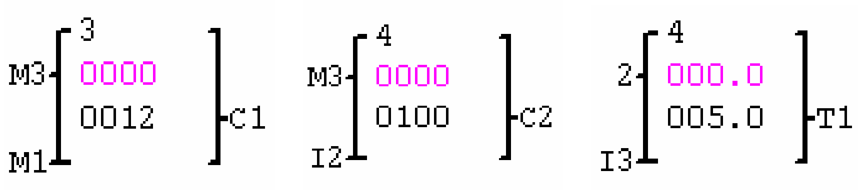
Wiring Diagram and Program with SG2 applied at for Packing Machine



Ladder：



FUNCTION：



FBD：